JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES.

A Release from Bondage.

WITH us, all who are associated in the gas industry will to-day rejoice in its release from a long bondage. For many years—from the time that the incandescent mantle became a really serviceable and beneficial influence in aiding gas to maintain its rank as a popular and cheap source of illumination—the gas industry of this country has been under subjection, and its progress has been restrained by the (to many) prohibitive price placed upon that which would have been its strongest succourer in the years of its greatest need. The incandescent mantle has helped the industry; but, by reason of its price, not with that potency which it possessed within its frail-looking fabric. Had other causes than the true one operated in keeping the mantle at the price which prevented its general adoption, then perhaps there would not have been any ground for complaint. But when it was common knowledge that the mantle was simply made the plaything of financial circles in the City, and that it was only their rapacity which kept the mantle beyond universal reach, then there was good cause for complaint, resentment, and censure. That a great public service like that of the gas industry should have been kept in such unfair restraint in comparison with other countries, shows there was something which required remedying. If ever it came within the power of anyone to write the true inner history of the Welsbach concern from its commencement, we doubt not a tale would be told that would expose some of the worst weaknesses in the joint-stock company laws of this country; for there must be something wrong when there is an open door to the excesses which we believe would be revealed by such a history. The concern stands before us with a capital of $3\frac{1}{2}$ millions, for the supply of an article which to-day's position shows has a retail value much below former charges! The troubles which have come upon the Company—the load of litigation, the infringement of patents, the secret trafficking in mantles—are all traceable to the one cause. If, among others, the gas industry has not been altogether loyal to the Welsbach Company, it is simply because the Welsbach Company have not been loyal to the gas industry. Aggression of all kinds has been due, and due solely, to the want of a cheap mantle; and a heavy capital, brought about by a series of financial upheavals, has kept that cheap mantle from emerging from the door of the Welsbach factory.

But there is a real change to-day. The shareholders who were sick at heart waiting for the profit which they had a right to expect from their investments, appointed a Committee, composed of men who were able to see through the cloud that surrounded the Company, and who could make an accurate diagnosis of the insidious disease which had sapped it of a profit-producing vitality. The shareholders accepted the views of the Committee; and to them they confided the task of rehabilitating the concern. The story of what they have done is a brief but eventful one, and it has so recently been written in the "JOURNAL" that it need not be retold here. However, it is through the Committee, or rather through the new Board that comprises members of the Committee, and also through Mr. George Livesey, that the gas industry to-day has a freedom which would not, and certainly could not, under the old administrative auspices, have been a present possession. There was an avowed antagonism to the gas industry in the arbitrary administration of the past. That antagonism—as our readers already know, and will appreciate even more after they have read all that is stated under the heading of "The Incandescent Mantle "Settlement" in this issue—is now a thing of the past. A freedom undreamed of but a few weeks since in their power of purchase of mantles is now an actuality; and cheap mantles of several kinds may to-day be purchased without fear, and of all kinds by a simple compliance with the terms of the settlement. The importance of the settlement cannot be stated in words. It opens up—combined with cheap gas—the road to a country of opportunity whose possibilities are almost unknown, and only the borders of which have so far been developed by the gas industry.

The new Directors of the Welsbach Company were willing, and had, in fact, committed themselves, to relieve the gas industry from the oppression of dear mantles under which it had been labouring; but it was Mr. Livesey who pointed out to them the most effectual way in which they could at once do this, and the way which has been adopted. He gives an account of his work (in the circular-letter which we publish, p. 1079) in that plain matter-of-fact style of his which he would employ in referring to the most ordinary achievement. His individuality stands out in this document. In it, all can see his strength of conception, purpose, and will; and, so far as is possible under the circumstances, there is his usual self-effacement. The glory of his successful effort to remove without delay the millstone which hung about the neck of the industry, will come with the immediate impetus which the present changed conditions will give to the development of the lighting side of the industry. But the thanks of all who will reap the benefit are his due. For him the time during which the negotiations were pending must have been an anxious one; and the labour involved was, we know, constant, and beset with many difficulties. His task is now at an end. But, as his letter shows, there has been, besides labour and anxiety, very considerable expense—an expense which, under the circumstances, was absolutely unavoidable. The money spent was more than guaranteed by a few companies; but it will be a poor recognition of what has been accomplished if the whole of the outlay in securing freedom is allowed to be borne by them. Every gas undertaking, large and small, will benefit from what has been achieved; and therefore every gas undertaking, large and small, should contribute its quota of the expenditure. "It "is not for me," modestly writes Mr. Livesey, "to say "whether the result is worth the cost." Then it is for other people to say it. For our own part, we have already shown that we have no doubt upon the point. Then let the gas suppliers of the country show their appreciation by spreading the burden of the expenditure from the North to the South, and from the East to the West, and follow that action up by appending their signatures to the agreement; for that they will do so, we are aware, is the earnest hope and desire of Mr. Livesey.

The settlement and all the power it confers upon gas suppliers is so fully explained elsewhere that it need not be dealt with here. But there is one thing we should like to say before concluding. It is this—that while we do not, and shall not, favour one mantle maker above others, we would ask the gas industry to remember in their future dealings that the Welsbach Company of the past is not the Welsbach Company of to-day; and that it is due to their concession that the gas industry has so much immediate liberty. They held the key of the situation; and until their right to its retention was disproved, or it lapsed by the efflux of time, they could, if they had so desired, have prevented that liberty of action for, in the one event, certainly two years, and, in the other, for the greater part of the next five years. Gas undertakings must, in their own interests, make full use of the advantages gained; but they ought not now to allow the Company's past to militate against its success in future. It is true the Company will profit from the royalties which are to be paid upon mantles purchased outside their own business. But that profit may not represent what they would have gained had they retained in their own hands the production and sale of mantles at reasonable prices; and this, we take it, was the objective towards which the present Directors were marching before Mr. Livesey intervened, and hurried things into the position which the gas industry enjoys to-day.

American Gas Companies' Organization.

LAST week and this, we have been able, through the kindness of certain American friends, who supplied us with much information of a nature that is not to be found in print, to place before "JOURNAL" readers a comprehensive view of American gas companies' organization. This will suffice

to enable those who are at all interested in the subject to appreciate the kind of thing that Mr. George Livesey had in his mind, when he stated that the administrative machinery of companies in the United States appears to be much more effective than that existing for the United Kingdom under the Joint-Stock Companies Acts. We cannot say that the impression is well borne out by the facts. There is nothing in the machinery in question to ensure better working than is possible with the English system, assuming both to be equally well used. Where the American plan works best, it is due to the more essentially working-class character—using this term in the broadest sense—of American communities, which provides a better supply of competent administrators than is everywhere available in an older country having a large population of gentry, people retired from business, and semi-idlers living on their means. Of the latter are useless directors made; and, unfortunately, we have so many of them with us, and they play so cleverly into one another's hands when directorships are the stakes. Such men as Hooley would not swear by their "front-page" names if the British conception of the qualifications of directors were not hopelessly vitiated. It is always the same in England, whenever a new flood of companies is brought out for exploiting a novel industry. Suitability for the post of director is the last qualification thought of by anybody concerned in the promotion, and by the subscribers to the companies least of all. So the noble lord, and the gentleman who is "some-"thing in the City," strut their hour across the pages of the financial newspapers (for due consideration), until the crash comes, and some utterly undistinguished person is pushed by his own ability and the force of circumstances to the front, where he often finds it as much as he can do to keep the concern out of liquidation. After the shareholders' capital has vanished, the original front-page men retire and are heard of no more.

It is, of course, not the same kind of trouble with the administrators of British Gas Companies, and highly respectable, old-established joint-stock undertakings of the same class. Inefficiency is a weed which springs up only too quickly in any soil. Mr. Livesey's complaint is in reality no more than the burden of so many private businesses after the creating and the masterful guiding hands are withdrawn. The world is full of such derelicts—fine old firms, represented by an aged spinster or two living in close seclusion, or by a rackety youth who knows not the difference between a sovereign and a shilling. The fine old English custom of regarding business as a means to the end of dignified retirement upon a modest competency, which involves bringing up the sons of the commercial house outside its influences, is mainly responsible for this familiar spectacle. We are now brought face to face with a different ideal—the American ideal of never leaving off money-making while there remains a "combine" not brought off. The modern fashion of the American "trust" is not new in itself. It is a copy of the notable invention probably discovered, certainly practised, by the original Rothschilds, Hopes, and Fuggers, who founded financial dynasties that have outlived most political dispositions. All such corporations, whether formal or family, with perpetual succession and a fixed purpose, are subject to the law of change and of ebb and flow. The problem of succession must be of vastly greater practical moment in the dynasties of Rockefeller, Morgan, or Vanderbilt than it will ever be again for a Hapsburg or a Bourbon. There is no absolute despot in these days except the financier; and he must be born, as he cannot be made. The more completely the chance of a downright bad selection for office and power is eliminated from the organization of a company, the more nearly does the limitation of the scope for individual talent approximate to that of the ceremonial figure called a constitutional monarch. If you want a strong man, you must run the risk of getting the wrong man. That seems to sum up the position. A big commercial concern in a period of prosperity and protection is like an army in time of peace—the posts of power are very liable to be filled with correct nonentities, who are only found out when the pinch of hard times and war service comes.

Manchester Gas Affairs.

THE Manchester Corporation gas undertaking is one of the few examples of so-called "remunerative" municipal commitments which are really remunerative in the ordinary meaning of the word. Usually, as everybody is slowly beginning to perceive, when a local authority incurs debt for establishing and carrying on a venture which is expected to prove profitable, the result is an additional charge upon the rates in one form or another. It has, however, always been the tradition of the Manchester Corporation—and a very bad one at that—for the gas profits to subsidize the general rate fund to the tune of £50,000 a year; and the best that can be said for the convention is that it has usually been carried out by the Gas Committee, irrespective of their own wishes and knowledge of what is really best for the city. The truth of the matter is, that few thoughtful citizens chosen for responsible administrative office in connection with the gas estate of Manchester, have been able to resist for long (whatever their original prejudices on the point) the evidences that have poured in upon them of the depressing effect upon the undertaking of treating it as the milch-cow of the Corporation. Only the other day, the present Chairman, Mr. Alderman Gibson, made an ineffectual protest against the crude proceeding, forced upon the Committee, of putting up the price of gas for no other reason than that of paying the excess of "profit" to the rate fund of the city. As a man of business, this expedient must have appealed to Mr. Gibson as of a piece with the very worst traditions of monopolistic trading. The most stupidly-managed gas company of the old days of maximum dividends could do no more than grab profits by this means. The principle of competitive trading is, of course, different altogether from this, and prescribes that whosoever desires increased profit from his trade shall seek it by extending his business, making his capital go as far as possible, and improving the management of the property as a whole. Moreover, it is no longer true, if it ever was, that increased gas profits can be secured automatically by raising the price, which only "puts the consumer's back "up," and makes an opening for the competition which exists now in greater force than ever before in the history of the industry.

The Manchester Corporation gas undertaking has been sadly oppressed, and at the same time neglected, these many years past. While resorting to the till for subsidies, the Corporation never imagined that any particular skill or intelligence was requisite for bringing in the money; and they starved the property in every respect, until it became a by-word. Latterly, an improvement has shown itself in the counsels of the administration, for which credit should be given to the Chairman of the Committee and certain of his staunch supporters in the Council—all too few as they still are—and also in a very high degree to the Chief Engineer, Mr. J. G. Newbigging. The character of the amelioration in question may perhaps be best described as being a greater permeability to good modern ideas on the part of the Gas Committee. It has, of course, been Mr. Newbigging's part to act as the "vaccination officer" in this regard. He is so able and conscientious an engineer, and has kept himself so close to his tedious and often thankless task, that at last Manchester gas polity radiates a gleam of enlightenment.

This is how it is: The working of the department for the past municipal year has been satisfactory from the financial point of view. After providing for the interest and sinking fund, there remains a balance on revenue account of £57,250, out of which, according to order, the Committee hand over £50,000 to the City Treasury. The estimates for the current year promise similar returns, and a considerable increase of net profit, out of which the Committee propose to reduce by 9d. per 1000 cubic feet (making it 2s. per 1000 cubic feet) the price of gas sold for gas-engines, and to make a substantial addition to the reserve fund. The price of gas for lighting will be 2s. 9d. per 1000 cubic feet. The Committee are to be warmly congratulated upon this decision in both respects. The stinting of reserve funds now too commonly observable with municipal management is a reproach to the system. It is overlooked that the reserve fund is the financial fly-wheel of the machine, and that it operates very materially to the benefit of the consumers of gas, by saving them from irritating temporary increases of price—sometimes attributable to short-sighted management. As to the reduction of the price of gas sold for gas-engines, this is action upon the lines laid down by Herr von Oechelhaeuser, and supported in these columns on many occasions. If ever it could be truly said that gas is "cheap enough" for lighting purposes, it is true now for all those places where the rise in price due to the dearness of coal has been taken off again.

For this is the position of the gas industry, in Manchester as well as everywhere else: The incandescent method of gas lighting is making headway tremendously; and what

with cheapened mantles and the maintenance system, it will only be a question of a very few years—perhaps even of months—before the backwardness of England in this respect is made good. The saving of the gas consumer's pocket due to the adoption of the incandescent burner should satisfy him for the time being. It will therefore be distinctly impolitic to hastily give away anything in the price of lighting gas, in view of the possibility that the total revenue from this source may show a temporary falling off. In order to prevent any serious diminution of sales, the gas management must see to it that consumers for business purposes—in shops, factories, and so forth—do not take their advantage of incandescent lighting in economy of gas, but in increased brilliancy of effect obtainable at the same cost as before. That is the division we make between domestic and business consumers of gas for incandescent lighting—let the former spare his pocket, if he will, but let the latter make a brighter show, which will pay him better in the end. Meanwhile, the other uses of gas should be encouraged in every possible way; and of all these, the gas-engine demand is the one that is most desirable in the interest of the undertaking. Therefore, it is wisdom to make the heaviest cut possible in the rate for engine gas—especially where, as in Manchester, there is reason to expect competition from producer gas.

Although this notice of Manchester gas affairs has run to considerable length—not out of proportion to the gravity of the subject—we cannot omit to mention the good work Mr. Newbigging has done for the city by planting in its very centre the brilliant nucleus of a system of intensified Welsbach street lighting which has received, as well it might, the unstinted admiration of the Lord Mayor and the leading citizens. It should not be forgotten that Manchester has its own electricity supply—the largest and about the lowest-priced in England. Yet coal gas has beaten arc lighting in Manchester, by common consent. The particular installation in question, which, with peculiar fitness, surrounds the Municipal School of Technology, comes to 1·64d. per 1000 candle power per hour, which is cheaper than the old-fashioned flat flames, and about one-half the cost of lighting by municipal electricity. It will scarcely be possible for anybody who is connected with this technological school to run away with the illusion that electric lighting is more "scientific" than gas. Indeed, the Manchester opinion of the actual relations of gas and electricity is that, while gas must be "the light of the future" for streets and interiors generally, there will be plenty for electricity to do in working tramways and lighting large buildings.

Two Notable Advertisements of Gas.

Friends of the gas industry may justifiably hold that certain recent events in London, of very unequal gravity, bear in the main upon the same point of how desirable it is that the advantages of gas should be commended to the attention of the general public. One was a disastrous fire, resulting in the death of seven persons, which occurred from the upsetting of a lamp at No. 423, Hackney Road, on the night of Saturday week, in premises occupied by a ticket-writer, and therefore containing highly inflammable stock-in-trade. The shop was lighted by two hanging petroleum lamps of a pattern "considered safe." From the evidence tendered at the inquest by an Inspector under the Petroleum Act, the lamps had a central draught, with a circular burner, a brass detachable reservoir, and a side filling-hole. The occupier said that on attempting to extinguish the lamp at midnight, after turning down the wick, a flame shot up from it, and the oil came out. The body of the lamp was so hot that he had to drop it on the floor, where it flared up and set fire to the place. The rest happened in a few minutes. It was ascertained afterwards that the oil used was a Russian kerosene, bought at 7d. per gallon, and having a flash-point of 88° Fahr. Consequently, the usual statements were made at the inquest about the disappointed anxiety of the London County Council to have the flash-point of burning oil raised to 100° Fahr. at least; and the Coroner's Jury recommended that legislation with this object should be promoted by the Council. The circumstance of the oil being Russian, and the flash-point 88°, effectually barred the newspapers from raising again the parrot-cry about England being made the dumping-ground of low-flash American oil; but they did nearly as badly, by jumping to the conclusion that oil with a flash-point of 100° would not have brought about such a catastrophe.

If there is any vitality left in the curious Scotch-Radical combination to place American kerosene under legislative disadvantages, it must have been annoying to the wire-pullers to discover that the facts of this Hackney fire did not support their case. Had the oil been the familiar staple of the Anglo-American Company, what a powerful weapon this disaster would have placed in the hands of the Scotch traders! But it was not so. Consequently, those who profess faith in the adequacy of flash-point regulations to make petroleum lamps absolutely safe, were driven into the untenable position that, whereas there is evidently no salvation in having the flash-point raised from 73° to 88°, or by 15°, there would be perfect immunity in putting it up another 12°, making it 100° at least. The facts, to those who understand the subject, point all the other way. Here was a case exactly analogous to the fire on the *Warspite*, where it was the great heat of the body of the lamp, after it had been burning for some hours, that caused the holder to drop it, with the result that the hot oil flowed out and communicated fire to everything. The oil remaining in the reservoir had long surpassed the temperature of any possible flash-point, and was above the firing-point at which it would burn without a wick. The higher the flash-point, the greater the heat of the lamp; so that this is a matter in which what is supposed to be a factor of safety becomes a source of peril, if the lamp has to be handled at all.

The only logical deduction from this terrible casualty is that oil-lamps are not safe means of lighting shops filled with inflammable goods, when it is considered that wearied hands must put them out late at night. There is no comparison between the risk of this operation and the simplicity of turning off gas-burners of any description. It is all very well to lecture about the superior economy of oil-lamps—no disrespect to Professor Lewes—but this Hackney holocaust supplies one view of petroleum-lamp lighting which does not appear from lecture platforms. Yet it is always in existence, and only needs a very slight mistake to bring it into dreadful prominence. In all human probability, Alice Maud Denman (aged 26), her four babies, Alice Biggs (aged 26), and the humble hero Arthur Ragelous (aged 24), carman, who lost his life in attempting to save theirs, would have been living now had the house been lit by gas. One could not say as much for the consequence if the lamp-oil burnt in the shop had been of the fancy brand favoured by the London County Council; and this is our case.

The other occurrence which brought gas into favourable notice was the prosecution of three citizens of London, at the instance of the Sanitary Committee of the Corporation, for causing a nuisance by smoke. Mr. Vickery, the Assistant City Solicitor, who appeared in support of the summonses, said the smoke nuisance had been the subject of serious consideration by the Committee, who had determined to let it be known that they are thoroughly in earnest in endeavouring to bring about some abatement. The use of coke, he remarked, would prevent the nuisance; "and there was a "better way still, and that was to use gas-ranges." From these remarks it may be concluded that the defendants were cooks or bakers. The Alderman sitting at the Mansion House regarded the cases as being all most fairly stated by Mr. Vickery. The Sanitary Committee have no wish to put undue pressure upon the citizens; but they consider that the time has now come to make an effort to bring backward tradesmen to a sense of what the resources of civilization can do to abate an intolerable nuisance. The Committee do not wish to be unreasonable; but steps must be taken to clear the City. The Alderman treated the cases as typical, and imposed small fines and penalties, together with giving the warning that abatement and prohibition orders would be issued within six weeks. This is the way to go to work. Old-fashioned cooks and refreshment-house keepers who do not at this time of day know the advantages of gas-cookers will never learn them without the kindly help of the sanitary inspector and the magistrate.

Meeting of the North of England Association.

The North of England Association of Gas Managers is described as the premier of all the Provincial Associations This may be debatable ground; and, except in the interests of a healthy spirit of rivalry, we would not make use of the expression, which, however, it is fair to say, is that of one who has experience of the working of all the scattered bodies who are doing such excellent work in the cause of the gas industry. It would almost seem as if, although it cannot be said that these Associations came into existence just at

the moment of crisis in the era of gas supply, yet that, when that moment arrived, they had been, by some power uncontrolled from within, prepared for the work which is now devolving upon them. The advent of a powerful competitor, and the opening up of wider problems than had before exercised the minds of gas administrators, gave scope for thought and effort which the restricted requirements of former days had not called for; and the Associations have certainly shown a readiness and a power to enter upon their new sphere which is the inspiration both of gratification for the past and of confidence in the future. This is true of all the Associations, and of the North of England as much as of any. The meeting last Saturday at Newcastle was a fitting one with which to close the twenty-fifth year of the existence of an organization which has always been vigorous. Its success must be chiefly ascribed to the energy of the President, Mr. Matt Dunn, of Goole. Keeping himself in the background, he was able to fill up the *agenda* with technical matter which would have been more than could have been overtaken if circumstances had not prevented two of the authors of the papers which were laid before the meeting from coming forward to submit them; while there are further contributions left over for future occasions. A man who applies his talents to the discharge of his duties will always leave his mark upon his time. This will be found to be the case with Mr. Dunn, whose year of office as President will certainly be looked back upon as one of the most useful in the experience of the Association. While saying this, it is not to be forgotten that a good crop cannot be raised by toil and stimulus alone; there must be a fertile soil as well. In this respect, both the President and the Association are fortunately situated. A good President had a good membership to support him—a happy combination; and the result has been the drawing closer together of the members, to the manifest betterment of their common position.

Two of the papers before the meeting dealt with construction work, which must always command the attention of men whose efforts consist in great part of grappling with forces which are underground, and therefore occult, and which, moreover, are as varying as, and much more fickle than, the wind which "bloweth where it listeth." Mr. Walker, who has been elevated to the position of President, justified his selection by a paper in which he recounted his difficulties in keeping abreast, in the matter of distribution, with the demand for gas in a district where needs are successively bubbling up in new places, and his methods of overcoming those difficulties. Mr. Bancroft's paper was upon a subject of less moment, because of the rarity of the necessity for tunnelling subways. And yet men have made their reputation by the accomplishment of work of not much greater magnitude, as, for instance, Brunel in the tunnelling of the River Thames. The value of Mr. Bancroft's paper is in its detail of the work done, and in getting it upon record, because it then becomes a "text-book" for anyone who may find it the more convenient way to go under than round an obstruction; and this is a much more common experience now than it has been. The third paper, that by Mr. J. Holliday, of Hull, was more academic, and more discursive, than the others. Had he been present, it would very probably have brought out sharp conflicts of opinion. As it is, it should be the means of leading the thoughts of his colleagues into a line which ought not to be one for mere speculation, but for action as well.

Doubtless many members were drawn to the meeting by the fact that there was an exhibition of gas appliances open in the town; and as it was an understanding that a visit was to be paid to it at the close of the other items on the programme, it may be acknowledged as one of the things which made for the success of the meeting. As to the success of the exhibition itself, that is, it is a pleasure to record, already assured; and it is as pleasant to admit that it is thoroughly deserved, being, as it is, the outcome of earnest preparation and careful management by all concerned in the arrangements.

The Egging-on of Lichfield.

THE issue of the "Municipal Journal" for April 19 contains a neat specimen of the manner in which local authorities are egged on to commit themselves to electric lighting ventures. It appears that Lichfield has no electric light yet, although the Corporation last year obtained an Electric Lighting Order. Hereupon we are obliged with the information that "Lichfield is a company-ridden city, and the absence of all "remunerative undertakings has a tendency to make the "rates high." The suggestion is deliciously artless. It is further stated that at the last meeting of the City Council, a member suggested that, as the Council are not in a position to carry out the Order, they might advertise for tenders from electric lighting contractors. For offering this suggestion, the councillor is blamed by our contemporary, and his action is described as unworthy of a Progressive; it being observed hereupon that "no doubt" a company would be quite ready to buy the electric lighting rights under the Order for "several thousands." It would be interesting to try the experiment. We do not for the moment recall any precedent for valuing such a privilege as a large asset. Be this as it may, Lichfield is adjured by our independent contemporary to "take steps to prepare a scheme." The Council are told that they should not be deterred by their heavy expenditure on their sewerage scheme, or the high rates, from going deeper into debt for electric lighting. "A loan for electric lighting is quite on a different footing "to one for laying down a new sewerage scheme. It is "money invested in a remunerative (?) undertaking, which "will ultimately be of great profit to the city; and one of the "greatest boons resulting from it will be that the present "charge for gas will probably be decreased." Was ever a more extraordinary argument used with such an object?

Of course, the point is driven home by a triumphant reference to what is said to be accomplished somewhere else. Another cathedral city (not Bath) is named as worthy of a visit by the reluctant Lichfield councillors, in order that they may see what wonders of rate-saving a particular consulting electrician, whom we have no intention of advertising, has achieved. Why select one brilliant example out of so many jobs against which the same familiar name is set? By all means let the saving of rates be the test of the successful electric lighting engineer; only let the examples be fairly numerous and representative. Then we shall see what we shall see; but, in the meantime, there need be no hurry on the part of Lichfield in the clever enterprise of bringing down the price of gas by plunging over head and ears in debt for electric lighting. The price of gas will take its own course, whether there is any electric lighting in the city or not.

Gas Exhibition in Newcastle.

It was in the nature of things that the ubiquitous exhibition of gas appliances should serve its purpose, and retire in favour of some further method of bringing before the public the advantages to be derived from cooking and heating by gas. The single-barrelled district show, promoted by one firm of manufacturers, has had its day. The distribution of cookers and heaters is now so extensive, that every alternate house has a permanent exhibition of them. There is still a wide and ever-widening field, however, for the application of gas; and the thoughts of some have been turned of late to the question of how best to open it up. A notable effort in this direction is being made by the Newcastle and Gateshead Gas Company. They do not discard the exhibition, but improve upon its previous state. A suitable building having been secured, they have had it tastefully fitted up, and into it they have been able to bring specimens of all that is latest in the world of lighting, heating, and cooking. More than that, the officers of the Company have, at what must have been an immense amount of trouble, brought together a highly educative exhibit in which the visitor may learn how gas is made, and see the pains taken to purify it before it is sent out from the gas-works. The lighting of the place by means of gas compressed in Keith's apparatus has been effectively carried out; and in that connection there is an illustration of a new outlet for the use of gas, in the shape of photographic portraiture. Photography by artificial light has been practised for years; but the lighting has always been a matter of some difficulty. Now, with a few high-pressure incandescent burners, the light can be diffused so as to produce effects which cannot be excelled in daylight. It would be invidious to characterize individual exhibits, when all are so outstanding. The exhibition is a huge success, which is the best justification for its existence. A blaze of light in pleasant environment, with novelties on all sides, and with the charm of music in the air, has had the effect of bringing the community of Newcastle out in throngs, and when there they see and learn things about gas which hitherto they had not comprehended. Too much credit cannot be given to the Gas Company for

their wisdom in making the advance they have done, nor to Mr. W. Doig Gibb, the Engineer, and his brother officers, for the heartiness with which they have entered into the project, and the thoroughness with which they have made the arrangements for the exhibition.

The Examinations in Gas Manufacture.

In another part of the "JOURNAL" will be found the question papers set by Dr. Harold G. Colman for the examinations in "Gas Manufacture" conducted by the City and Guilds of London Institute last Saturday. We commend them to the attention of all who are contemplating presenting themselves for examination next year, with the view of testing their knowledge of the technical details of a business in which there will always be found room for capable men. In the Ordinary Grade, the questions cover subjects ranging from the construction of a setting of seven retorts to the fitting up of a six-roomed house for the use of gas for lighting and cooking purposes—a sufficiently wide area, it must be acknowledged, for the aspirant to travel over. But it is in the questions in the Honours Grade that the Examiner shows he is abreast of the times, and manifests his desire to ascertain how the candidates for entrance into the serious work of gas manufacture and distribution stand in this respect. Last year, he required them to tell him what they knew about sperm candles, the Methven screen, and the Harcourt pentane lamp. This time they had to inform him as to how they would determine the calorific power of a combustible gas, and explain the difference between its "gross" and its "net" power. The questions put in connection with the manufacture of carburetted water gas were certainly necessary in view of the position occupied by this system as a valuable auxiliary of the older one. Finally, "low-grade" gas comes in for attention; the last question containing an invitation to the candidate to "discuss" the relative advantages and disadvantages of the supply of this quality of gas under modern conditions. Only eight out of the ten questions in each paper had to be answered. But we trust, for the sake of the candidates, that the two bearing upon the latest phase of the gas industry were not passed over by them.

Gas Supply Abroad.

In our daily press, a considerable amount of attention is given to the affairs of the world abroad, political and otherwise; and the importance of that information to a great commercial nation like ours, with interests in every part of the globe, is invaluable. Even so is a knowledge to any particular section of our home industries of what is going on in the same line elsewhere. Recognizing this, it has always been our aim to tell our readers what is passing in the gas industries of all countries, so far as it is procurable—not only in regard to technical matters, but from the commercial standpoint. It is undoubtedly from the former that we are able to profit most; but, just as the ordinary man takes an interest in what is going on (say) in West Africa or the South Sea Islands, so we believe that the gas man at home is interested in knowing how gas affairs are wagging in their commercial aspect in far parts of the world. Not only is interest found, but we are fain to believe that the story of the difficulties which the gas managers' professional brethren abroad have to cope with, and intelligence of their successes and failures, are of use, in some cases, in increasing activity at home—exactly, as we know what is done at home is an incentive to action abroad. Therefore, we endeavour, by selecting a few representative Companies abroad and reporting their proceedings, to keep readers informed of how things fare with gas commercially in various parts of the globe.

Difficulty Sharpens Wits in Buenos Ayres.

We have a good illustration this week in the River Plate Company. This is a concern with an issued capital in shares and debenture stock of £1,158,570; and the business is carried on in competition with two other Gas Companies. This is a condition without parallel at home now. But in addition to this competition, the rise and fall in trade have a more direct impression on their business than similar changes here, as shown by the tale told by the Chairman at the meeting. Last year low prices for wool, and then a drought, led to a falling-off in consumption—the Company's customers feeling acutely the need of economizing. Shops closed earlier on the same account, and people instead of using three gas-jets satisfied themselves with one. Empty houses were to be counted by thousands, where it was difficult formerly to find one to let; and the Municipality even went the length of ordering the Company not to light some 400 of the street-lamps. This is certainly carrying economy to the extreme. The falling-off in consumption was about 5 per cent.; and this set the Company back practically to where they were at the end of 1900. Yet they entered on their books during the year 933 new consumers. This sensitive rise and fall in consumption through external causes must keep the officials constantly intent; and the fact that the undertaking suffered so little financially and strengthened its backbone with such a substantial addition to its constituency, speaks volumes for the alertness and loyalty of the officials to the interests of those whom they serve. A further proof of this is found in the fact that the Electric Companies only succeeded in taking from this particular Company 51 customers in 1900 and 34 last year; the last-named loss being a grain to the gain. A capture of 933 new customers, with both gas and electric rivals in the field and a general economy being practised through commercial depression, is a success which we on this side cannot fail to admire. Truly the stress of competition and other difficulties sharpen the wits out in Buenos Ayres.

Moisture Deposited by Carburetted Water Gas.

In the paper by Mr. Greenall, at the meeting of the Eastern Counties Gas Managers' Association, in which he described the "Positive" gas-meter, the following remark appears: "With regard to moisture carried by the gas "itself—and especially where water gas is used in connec-"tion with coal gas—this may in course of time increase "the amount of the sealing fluid." Mr. J. Carter challenged Mr. Greenall on the point as to carburetted water gas; and that gentleman candidly admitted that he knew nothing about it. But he explained that his informant was a corporation meter repairer, who had told him that he sometimes took out of a 200-light meter a bucketful of moisture, and that the moisture had increased since they began using carburetted water gas. Since the meeting, Mr. J. Arnold Norcross, of Messrs. Humphreys and Glasgow, writing to us, mentions this matter; and we may extract from his communication what he says on the point. He remarks: In a sense, there are no such things as coal gas and carburetted water gas. Each is a mixture of a number of gases in varying proportions. Both are compounded of the same ingredients, and in proportions varying only somewhat more widely in the two cases than from time to time in each mixture. Any gases in free contact with water, as in washers, scrubbers, and storage holders, will become equally saturated with water vapour. The subsequent deposition of this moisture is due to a state of supersaturation, brought about by a fall in temperature or an increase of pressure—in gas mains and services, it is due to the former. This rule applies equally to coal gas, to carburetted water gas, or to any other gas or mixture of gases. It therefore appears that Mr. Greenall's informant was in error in his explanation of the phenomenon which he reported.

Incandescent Mantle Patents.

It is a somewhat curious coincidence that, in the very issue of the "JOURNAL" which contains the agreement come to by the Welsbach Company with those who had been disputing the validity of the 1893 patent, it should fall to our lot to publish no less than three abstracts of patent specifications which have reference to the process of manufacturing incandescent mantles. Hitherto patents of this character have concerned only a very few people; but under the altered condition of affairs, they will doubtless become of great interest to a large section of our readers. With the possibility that under the new arrangement some gas companies may be inclined to manufacture mantles for themselves, either completely or partially, such inventions as those to which we now call attention become of more general importance than has up to the present time been the case. One of the patentees in question—M. Charles Clamond—was closely identified with the first practical attempts at incandescent lighting, back in the early eighties; and it is therefore of particular interest to find him again coming to the fore, at the present juncture, with a proposal which, if his claims are substantiated, cannot fail to be a great boon to the industry. The object of M. Clamond's invention is to remedy, as far as possible, the defects to

which refractory mantles are liable—that is, fragility and lack of cohesion, too great flexibility when incandescent, shrinking from continued burning, and progressive loss of oxide of cerium or other excitant employed—by replacing pure oxide of thorium by a mixture of oxide of thorium and oxide of zinc. If it should prove in practice that he has attained the end he has in view, M. Clamond will have earned the gratitude of the gas profession at large, for he will have removed the greatest disadvantages under which incandescent gas lighting has hitherto laboured.

WATER AFFAIRS.

The Progress of the Water Inquiry.

THE proceedings at the second sitting of the Joint Committee on the London Water Bill consisted principally of evidence in support of the case for the promoters. Before any was given, however, the exact position of the Water Companies was clearly put before the Committee by Mr. Pember. It was advisable that this should be done, in order that no possible misunderstanding might arise. The Companies are, of course, undesirous of parting with their property, which they have never been shown, by any Royal Commission or Parliamentary Committee, to have so mismanaged as to call for its expropriation. At the same time, if it is considered that it would be to the public advantage that it should change hands, all they ask is that the transfer shall be effected on fair and reasonable terms, and after such inquiry and investigation as shall permit of those terms being satisfactorily arrived at. The Companies' position having been thus plainly stated, the first witness on behalf of the Local Government Board was called, in the person of Mr. Charles Perrin, the Official Water Examiner for the Metropolis, who produced statistics of population, rateable value, and so forth, which will be valuable to the Committee as showing the extent of the Companies' operations. As this was all the evidence the promoters intended to submit in support of the general proposals of their Bill (the financial matters being deferred), Sir Edward Clarke very naturally expressed surprise—shared by Mr. Pember—that no one was to be called to justify the action of the Board in fixing an "appointed day" for the transfer of the undertakings. Here was a case of a most unusual course being adopted, no doubt after due deliberation, and yet the reason for so doing was not to be challenged. As Mr. Pember very properly pointed out, this was lifting the burden of proof from the shoulders of the promoters, and putting it upon those of the opponents. Eventually, Mr. John Lithiby, the Assistant-Secretary of the Board who has had charge of this matter, was called to defend the Department. Briefly, his evidence was to the effect that the Board had come to the conclusion that it was to the interest of the water consumers of the Metropolis to fix a day for the transfer, and that in making it some time within twelve months after the 24th of June, 1903, they were giving the Companies sufficient time to prepare their cases. Mr. Pember put before the witness the peculiar position in which the officers of a transferred undertaking would be placed under this arrangement; but he studiously declined to realize it. The next witness was Mr. F. G. Banbury, M.P., who gave evidence on the financial proposals of the Bill; and this brought the sitting to a close.

The Committee resumed their inquiry on Thursday, when further evidence was given on behalf of the promoters. The first witness was Mr. James Mansergh, who spoke to the importance of fixing upon an early transfer day, in order to put an end to the working of eight independent concerns, which had, in the past, led to premature expenditure of money which might have been avoided if the entire business had been under one management. With regard to the position of the officers, he thought they should not be fettered in any way by the changes. When the time came for expressing an opinion upon value, they should be regarded as witnesses for the Companies. Mr. Mansergh acknowledged that the transfer of the officers of a concern before the award on an arbitration was made was not usual, and in the case of a single Company selling, the officers might reasonably remain with them till after the conclusion of the arbitration proceedings. This was all the evidence in support of the Bill. As the petitions of the Water Companies were to taken last, Mr. Balfour Browne had the distinguished privilege of opening the opposition, on behalf of the London County Council, whose Comptroller—Mr. H. E. Haward—was the next occupant of the witness-chair. The evidence he gave was naturally directed against the financial proposals of the Bill, especially the suggestion to award an amount of water stock equivalent to the ascertained money value of the purchased undertaking, which, he said, was open to serious objection. In his opinion, the payment should be in cash, with an option to the vendor to take stock by agreement; and he thought there would be no difficulty in raising the money. He considered that the first thing should be to ascertain the value of each undertaking, and then settle the amount of water stock equivalent to such value. This was, however, not provided for in the Bill, nor was any financial machinery to be found therein, which he regarded as being contrary to the public advantage. He objected to payment by agreement, on the ground that it might lead to fixing too high a price. Mr. Pember then addressed the Committee against the proposal for the transfer of the undertakings before the ascertainment of the terms of purchase; contending that the elementary English law, that a purchaser should not take possession of something for which he had not paid, should not be departed from in a case like the present. If compliance with this principle postponed for three or four years the unification of the London Water Supply, it should not be hastened to the detriment of the Companies who had for so long been responsible for that supply. Sir Edward Clarke followed in the same strain—urging that it would be better for a new body to assume their responsibilities gradually than to take them upon themselves all at once. Mr. George H. Hill was called in support of these contentions; and the Committee adjourned till the next day.

On Friday, the attack on the Bill was opened in real earnest. Mr. Hill was once more placed in the chair, and expressed himself strongly in favour of conducting the proceedings incidental to the transfer of the Companies' undertakings in the manner which has been followed for many years—in other words, in general accordance with the provisions of the Lands Clauses Act. With regard to the officers, he thought they should be retained, and also the works and plant, until the arbitration had been concluded. He admitted that this would involve the completion of eight inquiries before the new Board came into power; but he considered that this would be preferable to the arrangement proposed in the Bill, which was a new and untried one, and therefore would be attended with risk. At the same time, when asked point-blank if he could indicate any provision in the Bill which would inflict hardship upon a Water Company, he candidly confessed that he could not. The next witness was the redoubtable Sir Frederick Bramwell, who declared that in the acquisition of such undertakings as those in question no better procedure than that under the Lands Clauses Act could be devised; and, moreover, it had been recommended by the last Royal Commission. If a man were compelled to part with his property, he ought, at least, to receive the whole of its value to him, and a little more if the Umpire considered he deserved it. In the present case, however, the Arbitrator would be fettered. Here there was no pressing need for unity of management, and therefore the proper thing was to first ascertain the price to be paid for the undertakings, and then pay it, before they were transferred. Mr. Fitzgerald found he had a by no means easy task to get much out of Sir Frederick in cross-examination. The witness confessed that he had formerly been averse to unification; but as Parliament had decided in its favour, he loyally bowed to their decision, though he wished that they had not come to it. At the same time, he claimed proper arbitration upon the customary lines, with some allowance—he would not say 10 per cent.—for compulsory sale. Mr. Charles Hawksley followed, expressing similar views to those enunciated by his predecessor. He thought the procedure substituted for the Lands Clauses Act would be calculated to interfere with the free action of the arbitrators. Mr. E. M. Eaton and Mr. Henry Rofe gave evidence on much the same lines; the latter stating that he certainly would not, nor did he think any sane man would, accept the responsibility of an arbitrator under the provisions of the Bill. The examination of Mr. Rofe brought Friday's sitting to a close. The inquiry was resumed yesterday, and will be continued daily till Thursday. If the Committee can meet four days a week, good progress should be made by Whitsuntide.

ESSAYS AND REVIEWS.

THE INCANDESCENT MANTLE SETTLEMENT.*

The settlement of the incandescent mantle litigation "out of Court"—after the long and weary wait which all who were interested in the matter, whether as sellers or buyers or suppliers of gas, have had—has, through the unobtrusive amount of information vouchsafed, created a temporary suspense. The terms of the public announcement of the settlement agreed upon by the legal advisers to the parties in the case of the *Welsbach Incandescent Gas-Light Company, Limited, v. The United Chemical Works, Limited* (now trading as the Guaranty Incandescent Mantle Company), were ambiguous to the extreme; and this, as we expected, has produced some uncertainty. But of one thing all buyers were certain—that, whatever the terms, cheap mantles were now to be obtained, the selling or using of which would not plunge the dealer or the gas consumer in that legal vortex from which the ultimate delivery is always cloaked until the event in such glorious doubt. But uncertainty there has been. Large buyers and users have not known exactly their position in the newly-created situation; and makers and sellers of mantles other than those who are the immediate parties to the agreement—the Welsbach Company, the Guaranty Incandescent Mantle Company, and the Voelker Company—have been somewhat doubtful as to the course which they ought to pursue under the altered conditions. Among the latter, some are still hesitating, and some have already made up their minds, which, in certain cases, a little further calm consideration may induce them to change.

The reticence of the present parties to the agreement to give information (we refer to the associated makers) is quite understandable, or, at all events, an independent observer is at liberty to put his own construction upon it. The agreement is of such a broad and open character (through, we venture to claim, the work of the intervening party, at the head of which was Mr. George Livesey), that there can be no doubt that the less said about it the better in the view of the three Companies who have already appended their signatures to the agreement. The longer it was not known, except to but few, that the door was wide open for all and sundry who chose to pay the price of admission, the better chance had the three Companies of getting their feet firmly planted in the selling market. Assuming we are right in this surmise, we do not blame them; in their position we should have been prone to act precisely the same way. But terms of this kind, involving so much to so many, could but remain the secret of an hour. Early last week several traders in the City knew precisely the conditions to which had been appended the signatures of the various parties who have been associated in the negotiations which have had such a happy termination; and they—or certain of them, at all events—were not particularly anxious for concealment. But we have no particular care about the agreement so far as the makers and sellers of mantles are concerned; our chief anxiety is to give to gas suppliers as early an intimation as possible of the exact position they occupy.

It is too early yet to pronounce a definite opinion on the agreements, for there are two—one for makers and sellers, and one for gas undertakings who desire the utmost liberty they can get in their buying. Time alone can show how the agreements will work. They still leave open the door to litigation, seeing that there is no compulsion upon any to submit themselves, if they choose to run the risk, to their conditions; and we question very much whether for any length of time they will remain unviolated. We see in them this danger, that, under the shelter of compliance in a degree with their stipulations, some unprincipled buyers and sellers will extend their business operations outside the terms to which they profess to adhere. Such a proceeding, we should unhesitatingly characterize as dishonest; and we sincerely hope that no one in the gas industry will be guilty of any such act. The best advice to all in the gas industry is: "Run straight. Buy, if you like, from the associated makers and sellers and from home nonconformist makers or sellers, too, if satisfied that there is no risk, or if you do not mind taking your chance." So far we have no interest in the matter one way or the other. "But do not take advantage of the clause of the agreement which will enable you to buy from abroad without exposing yourself to litigation, by making a smaller return than the actual purchase." This may be described as an insult to the gas industry. It is nothing of the kind, any more than are the clauses Nos. 7, 8, and 9 in the gas undertakings' agreement. We do not suggest that such a thing will happen. But being human ourselves, we know something of how strong the temptation is at times to break away from the strict rules of propriety.

The Road to the Settlement—A Word to Gas Suppliers.

But, before going further into the matter, a few words may be interpolated as to what led up to the settlement. The actions upon which everybody was depending to settle the disputed point as to the validity of the Welsbach 1893 patent were those which the Welsbach Company had instituted against the United Chemical Works, Limited (the "Guaranty" mantle), and the Voelker Incandescent Company, Limited. These actions have been pending for a considerable period. Whether the late Directors of the Welsbach Company or the defendants were either wholly or both partly responsible for the delay in bringing the matter to final trial need not now be discussed; but there is no doubt that the new Directors of the first-named Company have not put any bar to the early hearing of the actions. We have heard from the lips of one of the strongest opponents of the old Board of Directors—in fact, one of the defendants in one of the actions—that the present Board are a body of "good business men;" and we agree. But that by the way. The first action was near at hand, when Mr. Livesey conceived the idea of getting the gas industry—who are so deeply concerned in the matter—to aid the weakest side by providing the means by which the defendants could secure a representation equal in strength to that of the challenging side, and so get the question fought out to a satisfactory issue. A number of gas undertakings supported Mr. Livesey; and a body of evidence was collected of a quality and character which gave great satisfaction. Then there was a conference between Mr. Livesey and the Board of the Welsbach Company; and this was the first step in the negotiations that have brought about a result that will be regarded as of the utmost importance to the gas industry.

No one can estimate the value to the industry of the action which Mr. Livesey took in the matter. The agreement which has been arrived at is not such a one as might have been effected by two or three trading concerns acting alone. Mr. Livesey represented a third party; and of that party no stronger exponent of their requirement and champion of their cause could have been found. It is no use speculating as to what kind of agreement might have been effected had the Welsbach Company and the Guaranty Company negotiated without his intervention. Certain it is that terms so broad and beneficial to the gas industry as those secured would never have been thought of, much less conceded. It would have been too much to expect. Nor, in all probability, would a variety of mantles been purchasable with freedom at the price they can be procured at to-day. We claim that it was Mr. Livesey's action and that of the gas undertakings who guaranteed the funds under his scheme that has been mainly instrumental in bringing about this position for the gas industry. But at what expense? Large, it is true; but its largeness is justified by the end.

Now a word to those who have kept aloof from the scheme. To them we may put one pointed question: Is it fair, seeing that all gas undertakings will benefit from the action of the few, that that few should bear the whole of the expense? There need be no fear now of evil consequences under those frightful illegalities known as barratry and maintenance, which some folks—and with success among the timid ones—held up in order to keep the rulers of gas undertakings from enrolling themselves under Mr. Livesey's banner. It is not too late now to share the burden; and we hope Mr. Livesey will wait awhile before closing the account, in order to give other undertakings, besides the present guarantors, an ample opportunity of helping to defray the expenditure from which all will reap so much benefit. Cheap mantles have been obtained, and that is what the gas industry has been crying out for for years past.

The Agreement and the Position of Gas Undertakings.

Now, as to the agreements and the position in which gas undertakings will be placed. Regarding the agreement between the Welsbach Company and the conforming makers, we will respect an expressed desire that the exact nature of the terms shall not at present be divulged—"published in our columns" would be better words, seeing that the terms are known by several, and will soon be spread far abroad. By the agreement which they have signed, the Guaranty Company and the Voelker Company (and others are contemplating doing the same) are going to pay the Welsbach Company a small royalty. As much has been said in public before. Minimum prices for mantles have been fixed; and we regard these prices as decidedly reasonable—certain it is that they are not in any way inimical to the interests of the gas industry. There are other minor conditions which are of no special interest to anyone outside the agreement, other than makers of mantles. Any mantle manufacturer or seller in this country can take out a licence on the same terms as the Guaranty and the Voelker Companies.

Then we come to the position of the gas undertakings and gas consumers. They are now able to buy from any of the associated makers, without interference of any kind, at the best prices they can make for themselves; but if they want to buy from makers in this country who are not associated, or from makers abroad, then they must obtain a licence from the Welsbach Company, if they wish to insure themselves against legal proceedings. Under this licence, they will agree to pay a royalty of ¼d. per mantle for home productions and ½d. per mantle for foreign goods. It is here that there is a loophole for disloyalty to the agreement. But gas undertakings are placed in an even more favourable position than this; for if they choose, they can manufacture mantles themselves on payment of ¼d. royalty, without further trouble, during the period of the life of the 1893 patent. This is a strong protection for gas suppliers against any compact among makers to raise their prices; and as such it is valuable. Those undertakings who take a licence from the Welsbach Company will find a clause in it providing that should the Company allow a licence on better terms to any other gas undertaking, those under licence are to have their terms modified. No special arrangements have

* This article was written before Mr. Livesey's circular letter and form of agreement for gas undertakings was received. These appear on p. 1079.

been made for those who subscribed to the fund raised by Mr. Livesey. This, then, is, broadly, the arrangement that has been entered into, and we cannot conceive a settlement which is more favourable to the gas industry than this. We must repeat, in order to emphasize, the point previously advanced, that it would be extremely unfair that the few gas undertakings who guaranteed the funds which paved the way for this arrangement and all its benefits should be called upon to bear the entire expense.

The Welsbach Company.

There is one point which we should like to refer to in connection with the Welsbach Company, as we think that—in fact, we know that—the idea has got abroad that their having come to this agreement is an indication of the weakness of their case. We regard that as an injustice. From the time that there was a change in the direction of the Company, we have recognized that those who are now guiding the fortunes of the Company have within them more of the spirit of commercial enterprise than their predecessors had. There were those outside who were impatient, on the accession to office of the new Board of the Company, for an all-round and immediate change of policy, which would have been disastrous in the extreme to the concern. But to the common-sense man, it was plain that time would have to be allowed them to work out the surest line of reform in order that the new policy might have an abiding foundation. In doing this, they did not want to be trammelled with heavy and continuously expensive litigation, the final result of which possessed just as much uncertainty for them as for the defendants to the actions; and a verdict in the King's Bench Division of the High Court would only have been the first step of three.

Let us examine the position from what we take it would be their point of view. They desired as quickly as possible to set the concern on a good commercial footing; they were faced with immediate litigation which would have demanded their closest attention; the patent in question has only four-and-a-half years more to run; if they were successful in the litigation, then in January, 1907, they would simply drop into the position of any ordinary trader, subject to competition from all points; and the utmost energy meanwhile is required of them to prepare for that time. Therefore, we think, they have been wise to become parties to an honourable agreement which will bring profit to their shareholders in the way of royalty. They are simply facing now, but in a more profitable manner, the position with which they would be confronted at the end of the four-and-a-half-years, or earlier if they did not succeed in a contest over the 1893 patent. In addition, the makers who are affiliated under the agreement will make them all the stronger in sustaining their patent.

But there is other evidence that it was not a feeling of weakness that induced the Directors to put their pens to the agreement. It must not be overlooked that the natural consequence of the acceptance of a royalty throws upon the Welsbach Company the onus of maintaining the patent; and we believe there is some provision made in the agreement which will substantially assist them in doing this. Every mantle which comes into the market, or is on the market, unless it is otherwise proved that it does not violate the 1893 patent, must be brought before the proper tribunal. If the Welsbach Company neglect to do this, or if they do not succeed in any action which may arise to maintain their patent, then it follows that such neglect or such non-success would at once annul the present agreement, and royalty would at once cease. Therefore it does not follow that this agreement has relieved the Company from litigation; but it has given them breathing time to get their business into order, and it has given them the aid, and the strong aid, of several supporters. The difficulties of those who are now bold enough to oppose the Company and the associated makers are, from our point of view, immeasurably increased.

Of course, the Welsbach Company have had to prepare themselves for the competition to which they will soon be exposed from the makers who will work under the licence; and who have, in fact, been competing with the Company for some time. But that is a story of the past, and need not be gone into here. As the Company have already announced, they intend from next July to reduce the prices of Welsbach goods; and this reduction refers not only to mantles but to burners. In an interview, however, with the General Manager (Mr. Kenneth H. Buchanan) the other day, he said he should like this to go forth that, although the prices of Welsbach goods will be reduced in July, the Company intend to supply nothing but the best quality. The "C" burner, for example, will be absolutely the same "C" burner as is supplied at present; and the mantle will also be precisely the same. Reduction in price will not mean any deterioration in quality; and it is upon quality rather than price that they hope to maintain a pre-eminence in the incandescent market, and uphold the name of Welsbach above all others. The aspiration is admirable; and the decision is good so long as no one else comes along with goods of proved equal quality at a lower price.

Meanwhile, from the 1st of May, the Company are going to launch out some cheap lines in Sunlight goods, which the old Directors, so far as we can learn, allowed to drop into almost a state of desuetude by not pushing their sale. Now, in the "trade" list which the Company are issuing, we find the prices of Sunlight mantles quoted, according to quality and quantity sold, at prices ranging between 4½d. and 3d. Plain burners for use with these mantles are to be sold at from 6½d. to 6d.; and with bye-pass, at from 1s. 3d. to 1s. 2d. each. These burners, we are assured, will compete successfully with any other burner approaching the prices on the market.

The Guaranty and Voelker Companies.

There is no doubt about it that up to a point the Guaranty Company bore the brunt of the fight which came so close to an actual tussle; and next to them, of course, came the Voelker Company. The first-named Company have been vigorously preparing themselves for the present position, and so have the Voelker Company. The former, it will be remembered, a short time since had a fire at their factory in the High Road, Balham, but it only temporarily disorganized their operations. They have now installed themselves at the Phœnix Works, Streatham; and there they have plant and means for turning out many thousands of mantles a day, and they are still looking ahead. They are not reducing their trade prices. As a matter of fact, there will be a slight increase in the cost. The old prices to the trade were all net; but it is now determined to have certain prices, and to allow a discount of 30 per cent. from gross orders and 40 per cent. on orders of 1000. The trade prices before were reasonable; and now that the Company are paying a royalty on their productions to the Welsbach Company, the change, which is an almost imperceptible one, will, we think, be accepted as fair. The part which the Guaranty Company have borne in this litigation will long be remembered.

The Voelker Company announce that the retail price of their mantles is 4½d. They fully recognize that what is required is a cheap mantle of good quality; and there is no doubt that, recognizing this, they will do their part in meeting the demand. In their announcement, they point out (and this, of course, applies to the Guaranty Company and any others who may obtain a licence) that the arrangement between the Welsbach Company and themselves is in no sense an amalgamation. They will, of course, continue as hitherto to trade as a separate Company; and their trading policy will be entirely their own, and in no way governed by the Welsbach Company.

The Nonconformist Makers and Sellers.

Now we cannot shut our eyes to the fact that there are several sellers of mantles in this country who have already determined to remain outside the combination. It is not for us to say whether they are doing right or wrong. That is their own business; and they know their own business better than we do. We have our newly-found friend the "Vivid" mantle, for example. Those at the head of the Company who are introducing that mantle appear to be in the most tranquil state of mind; and the while (they tell us) they are cultivating a comfortable and increasing business. We are not surprised at this. When asked whether they intend to associate themselves with the other makers, they serenely reply that they have no intention of doing so; but that they are quite prepared to defend themselves and all their customers against any interference. There is something about their attitude which reminds us of the old popular song of some 25 years ago, the first lines of the refrain of which ran—

> "We don't want to fight, but 'by Jingo' if we do,
> We've got the ships, we've got the men, we've got the money too."

Then there are also the numerous importers of foreign mantles; and what of them? If they come under the agreement, they will be handicapped, for this reason, that they will have to pay a higher royalty than the licensed maker of mantles who produces his goods here, and, in addition, they will have to bear the costs of transit and risks from abroad. There are some of those importers who wish to come in under the agreement on the same terms as the home makers. Now this, we think, would be hardly fair. If they want to insure themselves against litigation, and if, doing that, they cannot import a mantle to this country at a price to compete in cost and quality with home-made ones, then our advice to them is to establish a manufactory of their own here. We do not think Germany would give our makers any special treatment if we were exporting mantles to them; and, surely, while the 1893 patent remains uncontested, they cannot expect the associated makers in this country to give them any exceptional privileges. If they cannot meet the competition of the associated makers, then they must either run the risk (as some have determined to do), or establish works on this side.

But we have another word to say to those who have not yet determined to associate themselves under the agreement; and we say it with all friendliness. It is this, that, if they have not a strong backing with which to support and push their business, or cannot offer some very pronounced advantages, then they should recognize that users will naturally feel somewhat dubious about patronizing them, particularly now that consumers will have a variety of mantles from which to chose at tempting prices. We are well aware of the fact that there are mantles for which it is claimed that they are not infringements of the Welsbach 1893 patent; but how are buyers, we ask, to be sure of this, until they are contested? We only advance these points for the consideration of those outside the associated makers. It matters not to us whether they unite or not; and it matters not to us who comes in and competes—our position being one of perfect contentment with the situation in which we find the mantle market to-day. At the same time, we entertain the belief that, within a few days, we shall hear from other mantle-supplying companies and firms that they have given their adhesion to the agreement.

We had made a note to say something about the prospects of litigation; but what is the good of speculating about that here?

We have put the present position before our readers as fully as is necessary; and others are now quite as capable of speculating as we are ourselves. Therefore, we will conclude with a simple expression of hope that, under the changed condition in which the gas industry finds itself, there will be a vigorous prosecution of a grand opportunity in the lighting field, and that success will attend all efforts.

CIRCULAR LETTER BY MR. LIVESEY.

Yesterday Mr. George Livesey posted the following circular letter to the subscribers to the Guarantee Fund, and enclosed with it a copy of the Memorandum of Agreement for use between the Welsbach Company and gas undertakings who desire to have a free hand in the matter of purchase. We are therefore in a position, which was unexpected at the time the foregoing article was written, to lay these documents before our readers.

SOUTH METROPOLITAN GAS COMPANY.

709, Old Kent Road, April, 1902.

THE SUBSCRIBERS TO THE GUARANTEE FUND TO DEFEND THE WELSBACH ACTION.

GENTLEMEN,

My first word must be one of thanks to those Gas Companies and Gas Committees of Corporations who have responded so liberally and promptly to my appeal of February last.

I have now to give an account of my stewardship. You were told that a Committee would be formed to administer the fund. But this could not be done until the promises were received, and, being dependent on the meetings of the various boards and committees, a month or more elapsed.

In the meantime, events were moving fast—in fact, the fund was only just started in time; for the long-delayed Welsbach action against one of the parties—the United Chemical Company, otherwise known as the Guaranty Mantle Company—was in the list for trial during the Term. The duty of immediate action, therefore, fell upon me.

Last year the Advisory Committee of the Welsbach Company asked my opinion on the relations of the gas industry to the Welsbach Company; and in their report they recommended the adoption of a policy of co-operation with the suppliers of gas. They received my suggestions and statements in such a fair and friendly spirit, that I felt bound on the day the Guarantee Fund was started to inform them of the fact, winding up my letter (dated Feb. 6) with the remark that "personally I should be glad if litigation could be avoided." A friendly response was the result, coupled with a request for an interview. In the meantime, however, I had seen the defendants of the pending action with their Solicitor; and, the Court having refused an application to postpone the trial, Counsel were retained and arrangements made for obtaining the necessary evidence—the latter being a difficult and expensive matter.

At the interview (on Feb. 17) with the present Chairman of the Welsbach Company and another member of the Advisory Committee, they assured me that, although they must do all in their power (which was obvious) to sustain their patents, they wished to work on friendly terms with the gas industry by selling the best article at the lowest possible price. They agreed to abolish all restrictions as to the use of only Welsbach burners with Welsbach mantles—users of their mantles being quite free to use any burners they pleased; but they were not prepared to allow the use of mantles other than theirs. The interview lasted nearly one-and-a-half hours; and, of course, the possibilities of the pending action were discussed. I thought we could make a good case; but, remembering "the glorious uncertainty of the law," I felt there was the possibility of losing, and the great probability of litigation being prolonged for two years—as the case would be almost certain to go to the Court of Appeal and then to the House of Lords. I therefore made the following alternative proposal: That gas undertakings—that is, Companies and Corporations supplying gas—should be licensed, on the payment of a small royalty, to buy mantles where they please, or to manufacture for their own use. This, of course, implied that the Guaranty Mantle Company, the defendants in the action, and other makers in this country should also be licensed to manufacture mantles under a royalty. If so, the patents of the Welsbach Company would be maintained and the actions-at-law withdrawn. The Welsbach Directors could not then agree to the suggestion; but the door was left open for another interview.

Then a great misfortune befell the Guaranty Mantle Company in the burning down of their factory at Balham. Had our guarantee fund not been in existence, I do not see how the unfortunate defendants could have gone on with the action; but the fund enabled Mr. Cave, defendant's Solicitor, to continue the work of getting evidence, &c.

Of course, I had reported to Mr. Cave what passed at the interview; and, in about a fortnight another conference took place with the Welsbach Directors.

The principle of a royalty under license being then accepted, other mantle makers became parties to the negotiations. There were many more interviews and conferences (the action was adjourned by consent to the next Term), for there were many minor points to consider and difficulties to overcome. But the final result is an agreement on the part of the Welsbach Company to grant licences under a small royalty to other makers, and to do the same with gas undertakings on the terms set out in the enclosed Form of Agreement, which may be signed or sealed and returned to Mr. Bush or Mr. Cave, the Solicitor. The terms are shortly as follows: In consideration of the validity of the 1893 patent not being contested, the Welsbach Company will grant a licence to the subscribers to the guarantee fund and to any other gas undertakings.

(1) They can purchase of the Welsbach, of course, and of any other mantle manufacturers who are Licensees of the Welsbach, on any terms they may arrange, without paying royalty.

(2) They may manufacture on their own account by paying a royalty of ½d. per mantle.

(3) If they buy of any home or foreign manufacturer or importer not under licence from the Welsbach Company, the royalty payable will be ½d. per mantle; accounts to be rendered half-yearly.

There is also a "favoured nation" clause in the agreement.

The Welsbach Directors inform me that their policy will be to supply mantles of such good quality that price will be a secondary consideration, although they have publicly announced a material reduction from present prices, to take effect on the 1st of July next. The other licensed makers will, I believe, endeavour to sell a really good mantle at a very low price; and I quite expect that the price at which mantles will be obtainable in quantities by gas undertakings will be at a price that will be so satisfactory that they will be under no necessity to manufacture for themselves.

I have promised to do my best to induce the subscribers to the guarantee fund to accept the agreement, and to take a licence from the Welsbach Company on the above terms. The expense will be trifling, which I propose should be borne by the fund, and that the Solicitor, Mr. Thos. Cave, of 20, Eastcheap, E.C., with whom I have acted throughout with great satisfaction, should act for the subscribers. I shall, therefore, feel obliged, supposing you can accept what has been done, if you will give your assent as soon as practicable.

Although many gas undertakings have not subscribed to the guarantee fund, being deterred by fear of "maintenance" and "barratry" or "champerty" (on which Counsel's opinion was taken) and other bogies, I did not feel it right to try to put them under any disadvantage. They can come in on the same terms as the guarantors; but, even if they do not take an agreement, they will get many of the advantages of the arrangement. It will, therefore, only be fair that they should bear their share of the expenses; there being no question that their funds can be used for the purpose.

As to the expenses—which I am sorry to say will probably amount to £3000—for, although the action was first adjourned, and then, by consent, withdrawn, all the costs of retaining Counsel, obtaining witnesses and evidence have been incurred, in order to make the case for the defence as strong as possible. This was absolutely necessary; for, until the settlement was actually consummated, there was always the possibility of going to trial. Probably about half the amount guaranteed will have to be called up. It is not for me to say whether the result is worth the cost; but I can say with confidence that, without the guarantee fund, this result could not have been obtained. Better terms could not be got; the only alternative was fighting out the action with all its uncertainty. The only point which in that case was not in doubt was, that the trade in mantles would for a long time remain in a state of chaos.

A list giving the names of, and the amounts subscribed by the Guarantors, is enclosed for your private information.—Believe me, yours very truly,

GEORGE LIVESEY.

P.S.—For the information of those gas undertakings not in the guarantee fund, I may add that, if they will give a contribution to the expenses equal to £1 for every 10 million feet of gas sold last year, they will be doing their share. If any excess is received, it shall be returned.

MEMORANDUM OF AGREEMENT FOR GAS UNDERTAKINGS.

MEMORANDUM OF AGREEMENT between THE WELSBACH INCANDESCENT GAS-LIGHT COMPANY, LIMITED (hereinafter called The Welsbach Company), of the one part, and

(hereinafter called the Gas Undertaking) of the other part.

WHEREAS as the result of negotiations entered into by Mr. George Livesey (on behalf of the South Metropolitan Gas Company and other gas undertakings) with the Welsbach Company for the purpose of securing the supply of incandescent mantles at a satisfactory price, the litigation between the Welsbach Company and the Guaranty Incandescent Mantle Company, Limited, and the Voelker Incandescent Mantle, Limited, with reference to the Welsbach Company's patent No. 124* of 1893, has been put an end to on the terms of the validity of the said patent being admitted, and of the Welsbach Company granting licences to those undertakings or firms at a royalty, and of the Welsbach Company and its licences forming an Association for protecting the said patent against infringement, to which Association other undertakings or firms may hereafter be admitted. NOW IT IS HEREBY AGREED by and between the parties hereto as follows:—

1.—The Gas Undertaking admits the validity of the Welsbach Company's patent No. 124* of 1893.

2.—The Gas Undertaking is free to purchase mantles from any member of the Association without paying any royalty, and the Welsbach Company shall from time to time keep the Gas Undertaking informed of the undertakings or firms constituting the Association.

3.—Should, however, the Gas Undertaking not be able to purchase mantles from any member of the Association at prices satisfactory to them, they shall be at liberty, for the purpose of supplying the consumers of their gas (but not otherwise), to manufacture mantles or purchase mantles outside the Association, and in that event they shall pay the Welsbach Company a royalty of a farthing per mantle on all mantles manufactured by them in the United Kingdom, and a royalty of one half-penny per mantle on all mantles manufactured by them abroad, or purchased by them from manufacturers or dealers not members of the Association.

4.—If Welsbach Company hereafter grants to any other gas undertaking a licence on less onerous terms, the terms mentioned in clause 3 hereof shall be modified accordingly.

5.—The Gas Undertaking shall not use the words "Welsbach" or "Auer" in connection with mantles manufactured by them or purchased from any manufacturer other than the Welsbach Company.

6.—Accounts of all mantles manufactured or purchased outside the Association in any half year ending 30th June or 31st December shall be delivered to the Welsbach Company within the first seven days of the following half year. Cash due for royalties to the end of each half year shall be paid within first month of following half year.

7.—The Gas Undertaking shall (if required by the Welsbach Company) deliver a statutory declaration by its secretary or other officer verifying their accounts.

8.—The Gas Undertaking shall keep proper books of account, and shall permit the Welsbach Company's auditors to inspect the same.

9.—In case of breach of this agreement by the Gas Undertaking, the Welsbach Company may (unless such breach be made good within fourteen days after notice in writing given by the Welsbach Company to the Gas Undertaking) cancel this agreement.

10.—The Gas Undertaking shall not at any time during the continuance of this agreement dispute the validity of the said patent, or directly or indirectly aid or assist, or directly or indirectly sanction or allow, any of their directors, officers, or servants to aid or assist anyone in disputing the validity of the said patent, or in defending any action for infringement thereof brought by the Welsbach Company at the request of the Association or otherwise.

11.—The operation of this agreement ceases upon expiry of the said patent by effluxion of time, or if the said patent be declared invalid, or if on trial of action the Court refuse an injunction on the ground of invalidity of the said patent; but, on decision being reversed or the said patent being amended so as to remove defect found by the Court, the liability to pay royalty shall revive as from the date of cessation.

THE GAS AND WATER STOCK MARKET.

Last week was account week on the Stock Exchange, and the business of the settlement was the most prominent feature. Still, there was a very fair amount of independent operating until the conclusion of the settlement, when things quieted down considerably, and fresh business was left over for the new week. The general tendency was good; keen financial noses scenting peace in the air, and prices (excepting in special lines) being buoyant, especially for the Funds, which rose nicely. The Money Market was firm, aided by Stock Exchange demands, which, however, were readily met; but there is no reason to anticipate any stringency in the near future. In the Gas Market, transactions were not as numerous as they had been the preceding week. But still they were well above recent averages. There was hardly any change in price; actual variations in quotations being very few and slight, and unimportant. In Gaslight issues, there was a good bit of dealing in the ordinary, although the volume of transactions fell below that of the previous week. The figures at which bargains were marked were remarkably steady. One only was done at 96; but, with this exception, all the rest were kept evenly between 94 and 95, and at the close there was nothing to indicate the approach of a movement either way. South Metropolitan was only moderately dealt in, and was steady and unchanged. Prices only ranged from 122½ to 124; and the first and the last transactions of the week were at the same figures, 123¾. Commercials were almost unnoticed; a single "special" bargain in the new stock being all the business done. In the Suburban and Provincial group, business was, as nearly as possible, reduced to nothing at all; and in the London market, there were no changes in quotations. In the local Exchange, however, Liverpool had a further retrograde movement of a couple of points. Among the Continental companies, there was more animation; Imperial starting off with a bound and changing hands at 214½. But it was not strong enough to last; and it soon began to give way, closing on Saturday with a final mark at no better than 211½. Union was done once again at 150; but it did not fall further. Among the remoter undertakings, Oriental old shares were fractionally lower. Business in the Water Companies remains quite colourless, and devoid of all feature. There was no change in values, except in Southwark, all the capital stocks of which had a fall.

The daily operations were: Gas opened more quietly on Monday, but prices generally were firm. Imperial rose 1½. In Water, Southwark ordinary fell 4½, ditto "D" 2½, and ditto preference 2. Business in Gas was fairly brisk on Tuesday and Wednesday; but there was no change in quotations. Activity was maintained on Thursday, coupled with steady prices; but Oriental £5 shares fell ½. Transactions were on a rather reduced scale on Friday; and Imperial receded 1. Saturday was quiet and unchanged.

Midland Association of Gas Managers.—The members of this Association will hold their next meeting at Great Malvern on the 29th prox., on which occasion they will be entertained by the Urban District Council, whose Gas and Water Engineer is Mr. H. P. Maybury.

Masonic.—Subscribers to the Royal Masonic Benevolent Institution whose votes are not already bespoken for the election on the 16th prox., are reminded of the claims to consideration for the case of Mrs. White, widow of the late Gas Manager at Sherborne. Mr. White left his widow practically unprovided for; a sum of £20 a year being all Mrs. White has now to depend upon. The case is influentially supported; but strenuous efforts are required to ensure success. Proxy papers for the ensuing election, and promises of votes for future ones—also any contributions towards the expenses entailed upon her by her candidature—may be sent direct to Mrs. White, "Arlington," Ashley Road, Upper Parkstone, Dorset, or to Mr. Walter King, at the "Journal" offices

ADMINISTRATION OF AMERICAN GAS COMPANIES.

(Second and Concluding Article.)

The organization of an important American gas company will vary slightly in accordance with the laws of the State under which it is chartered and carries on its business. These variations are not of any great importance, however, as affecting the administration of the undertaking; and we may therefore take for a pattern of the whole the forms of certain bye-laws prevailing in the States of New Jersey and New York. In the former State, it is provided that there must be a board of directors, consisting of (blank) members, elected annually for a year at the annual general meeting of stockholders. Vacancies occurring during the year are filled by the board, for the unexpired term. As soon as convenient after the general meeting, the board of directors meet and choose a president, one or more vice-presidents, a treasurer and assistant-treasurer, and a secretary and assistant-secretary, with such subordinate officers as the board may from time to time create. The offices of treasurer and secretary, and of assistant-treasurer and assistant-secretary, may be held by the same person at the discretion of the board.

The president presides at all meetings of the board and of the company. He exercises, under the control of the directors, general supervision and direction of all the departments in the company's service, and signs all stock certificates and contracts and other instruments, unless otherwise ordered by the board. The vice-presidents, in order of seniority, in the absence of the president, act for him, and perform such other duties as are imposed upon them by the board. The secretary keeps the minutes of all meetings, gives all notices, has custody of the company's papers and of the seal of the company. The treasurer receives and pays all moneys and keeps the company's funds. He is responsible for the company's books of account and finances, and signs cheques. He reports on the financial position of the company to the president whenever requested.

The annual general meeting of the company, at which all the directors go out of office, is held on a fixed date at the office of the company. Every share carries one vote; proxies being permitted. All elections of directors are by ballot, and the poll is kept open one hour, or until all the votes are in. Special general meetings are convenable upon the order of the board, or on request of the holders of a majority of the stock at the time. Regular meetings of the board are held monthly. Committees of the board may be appointed to exercise any of the powers of the board; and the board may appoint an executive committee to exercise all their legal powers and use the seal of the company. Amendments of the bye-laws may be effected either by a majority of the general meeting or a majority of the board. The last seems a particularly loose provision.

The bye-laws of a gas company of the State of New York, which we have before us, provide for an annual election of thirteen "trustees"—another name for directors. On the Friday next following the annual election, the trustees meet for organization, and proceed to elect by ballot from their number a president and vice-president, both of whom hold office for a year and until their successors have qualified. They also appoint a secretary, an assistant-secretary, and a treasurer, and the standing committees. The trustees may also appoint, at this or any subsequent meeting, a second vice-president, and such other officers as may be deemed necessary for the proper conduct of the business of the company. There is an executive committee of four members of the board, who are entrusted with the charge and direction of the practical operations of the company, under the control and direction of the board. In conjunction with the president, this committee possess and exercise all the powers of the board which can be lawfully delegated, and they authorize the purchase of all supplies. All orders for the expenditure of money are first approved by this committee. There is a finance committee of three members of the board, whose duty it is to supervise all matters appertaining to the finances of the company, to examine the securities and the collaterals, the cash and cash assets of the company, and report to the board monthly. A committee of accounts, consisting of three members of the board, direct the manner of keeping the books and accounts of the company, make a full examination of the same and of all receipts, expenditures, and vouchers for payments; and audit all the accounts, including those of the secretary. The committee's monthly report to the board includes a balance-sheet of the company's assets and liabilities. The committees elect their own chairmen and secretaries; and the president is *ex-officio* a member of all. There is a fixed monthly board day, but special board meetings may be called by the president or four members of the board. In the event of a division of the board, the names and votes may be taken down upon the demand of a member.

The president presides at all board meetings, and exercises a general control and supervision over all the concerns of the company, its officers, and servants, and sees that the bye-laws are strictly enforced. He has generally to do such duties as appertain to his office, or may in addition be assigned to him by the board. The vice-president performs such duties and services as may be assigned to him by the board; and he also acts for the president in case of his absence or inability. The duties of the secretary and treasurer, and of their assistants, need not be detailed. Amendments of the bye-laws may be carried by a

vote of two-thirds of the members of the board, provided that a written statement of the proposed changes shall be submitted at a previous regular meeting, and a copy posted to every member within ten days. The voting on such occasions is to be open.

Our information is to the effect that these provisions are carried out, subject to variations of emolument for the different officers depending upon circumstances. There is nothing in the regulations, it will be observed, touching the office of general manager, which often exists, and is the best paid of all. In America, whether in Canada or the United States, the presidents of gas companies are rarely men who have a practical knowledge of gas, although there are notable exceptions, which perhaps prove the rule. In general, however, the president is like our English chairman—that is to say, he presides over the meetings of the board and of the shareholders, and has the general supervision and direction of the company's operations, but without any participation in the detail of the work of the undertaking from day to day. In these cases, there will be a highly-paid general manager, or general superintendent, who has charge of the works and business, under the control of the president.

American gas companies of any importance, however, seem to be very keen upon getting the service of a man of proved worth; and they do not mind what they call him. When it is a case of making room for such a personage, he may be styled indifferently managing director, general superintendent, vice-president, engineer, or director-general. A capable gas administrator of our acquaintance answers to all these names, in different places; but the work is everywhere the same. Such an officer works, as a rule, in full sympathy with the executive committee of the board, already described. The presidents of many large United States gas companies are often men who have been successful in business, and hold a recognized position in the communities in which the companies operate; and this without any reference to their knowledge of the gas business, or lack of it. The influence and the reputation of such men are a protection to the companies, and a guarantee to the community that its gas undertaking will be honestly conducted. Naturally, such a general qualification almost precludes the possibility of the president being at the same time a practical gas man. But where such a president is available, his technical assistants can well be professionals.

It seems to be in America as in England, in this regard, that there is a point in the increase of magnitude of gas companies' operations at which this semi-retired-chairmanship ceases to satisfy the necessities of the situation, which is precisely where Mr. Livesey also draws the line. Not to be too personal it should be plain that the type of gas company chairman, or president, who would be the very ideal for Cheltenham, or a quiet town in the country parts of the State of New York, would scarcely be man enough for London or New York itself. The American system appears to provide for this exigency of important supply undertakings; whereas in England the impecunious peer, or the briefless barrister, is deemed eligible for any chair. Our British railway lords are a remarkable outgrowth of a very artificial system, which is fain to take social distinction when it cannot get executive efficiency. The financial troubles of most large American gas companies have taught the proprietary that they are only safe in the hands of a man who has a good general knowledge of the gas business, so as to enable him to understand to some extent the various requirements of the engineering side of the undertaking; while he devotes all his time, or a very substantial portion of it, to the general business of the company. Such are the men who have recently come to the front in American gas matters. They may or may not be trained and expert gas engineers; but they are not wanted to attend to the details of the engineering branch. It is sufficient if they are able to grasp the problems presented in the engineer's reports, so as to perceive why certain things are required, and what are the results expected. They should be able to decide upon the expediency and reasonableness of capital expenditure, and not be obliged to trust to their officers for everything.

In such an organization, the vice-presidents are simply the president's assistants, or "curates," although each of them may have a special line to look after—as transport, gas popularization, or the like. The ordinary directors would be simply business men, responsible for seeing that all things are properly done, in accordance with the appointed order. The president, where he is also the real head of the undertaking, might receive a salary of about £5000 a year. The vice-president would have about one-half, or two-thirds of this amount; the treasurer about the same. The directors are paid a fee of a couple of guineas or so per meeting. As regards the efficiency of this system in procuring good service in the administrative ranks, the American testimony is emphatically affirmative. It is believed that the system provides opportunities for those who possess talents. A good friend of ours observes on this head: "We believe that no one man possesses all the various qualifications that are required in the management of a large gas company; that if he has some qualifications in excess, he is probably deficient in others. The best results can be obtained by having the best men obtainable, each in the position for which he is specially qualified."

It would be a mistake, however, to think that the American plan of gas company organization is in any sense uniformly applied throughout the country. There is really no cast-iron regularity of plan. Then it is equally true that efficiency has had to be sought by the hard lessons of competition and adversity. The days of the making of dividends by the simple method of putting up the price of gas were signalized by much easy-going gas administration. Even if American gas companies were not "*quasi*-Departments of State," they were snug harbours where the manager could "put his feet up" and take life gently in his easy-chair. The division of the American gas industry into two opposing factions, one for water gas and the other for coal gas, and the introduction of electric light, banished all this idleness and red-tapeism for ever. Gas securities fell, and undertakings were snapped up at depreciated values by knowing speculators who had good men of business to put in wherever they were wanted. Then was the opportunity of good gas administrators; and that is how the modern highly-salaried American gas specialists came into their own. The companies which were not so efficiently organized began to feel their disadvantage, and are trying to correct it.

The great gain of all this agitation of the previously stagnant pools of the American gas business is that the men of engineering training are coming to the top. Time was when financiers, schemers of the Addicks kind, flattered themselves that money was to be made in gas by stock manipulation, and general office "smartness." In this way bankruptcy was courted; but the day of the engineers has returned, and the future of the American gas industry is actually in the hands of engineering experts whose names are as familiar in the United Kingdom, and as respected, as they are in the strenuous country where they have usually built up large fortunes for themselves.

This is the last word of one of our American correspondents who has favoured us with his views of the general question raised by Mr. Livesey: "I am emphatically of opinion that your big companies could do much better if the presidential chair was filled in each case by a man, for instance, of Mr. Livesey's type. Of course, there are not many of his class to be found; but there are degrees. The president should be familiar with all details of the business. He should be broadminded and a manager of men; and if capable of really filling this position of one of the largest companies, his services should be worth from £5000 to £10,000 a year. I have two cases in mind in this country to-day where such salaries could be paid if the right man could be found, and where after paying a salary of £10,000, the profits could be largely increased." The observation is of more than American applicability.

THE TRADES UNION CONGRESS IN SCOTLAND.

To seek in the character of the man from whom one differs, rather than in one's own conduct, the cause of that difference, is undoubtedly a foible to which most men are liable; and in this respect Trade Unionists are pre-eminently human. Of this, we have a very good example in the address delivered by the President of the Scottish Trades Union Congress at Falkirk last week. Mr. Muirhead, in the course of his address, complained bitterly of the apathy of working men towards Trade Unionism, and evidently found it difficult to understand how it is that seven out of every eight labourers in Great Britain can be such fools as not to embrace with eagerness all the blessings that Trade Unionism is only waiting to shower upon them. It can only be their apathy and stupidity that keep them from joining the organization whose one object is to "improve their lot and sweeten their lives." That Trade Unionism fails to attract the best class of workman because it has failed lamentably to attain its ideals, has abused its powers, and has created a tyranny in the name of freedom, has never come within measurable distance of penetrating the self-satisfaction of the leaders of the movement, who are always claiming the sole right to speak in the name of Labour.

We have said that Trade Unionism has failed lamentably to attain its ideals. There is no need to go far for a clear proof. Mr. Muirhead, in the course of the usual flowery peroration that concludes such addresses, said: "They must therefore jealously guard the interests of the people, as workers, as citizens, as men, and as women. . . . Every man his brother's helper. What a glorious ideal! What a basis on which to build the social millennium." That is the ideal. How beautiful it sounds, and how well it accords with practice. It seems almost cruel to ask whether on the corner-stones of "the basis of the social millennium" are to be inscribed the names of Giblan, hounded out of employment in Wales by his "brother," the Trade Union Secretary, and Thomas, driven from his work by that noble band of brethren, the Amalgamated Society of Carpenters and Joiners, and of many another workman crushed by the iron heel of "freedom." Trade Union leaders must descend from poetical perorations to more practical proofs of universal brotherly love than that of doing their best to drive him into the workhouse, before they can hope to bring about the unity of the working classes for which in their own interests they are so anxious.

Mr. Muirhead, in common with many other Trade Union leaders who are inclined to over-estimate their importance in the national machinery, is very desirous that there should be a large increase in the number of direct Labour representatives in Parliament, and is possessed with the idea of what the ten million working men of the kingdom could do in this direction if only they would unite—under the banner of political Trade Unionism. Fortunately, those working men have a truer notion of what makes for their best interests than the Union leaders—and this

notion does not include the swelling up of those leaders into Members of Parliament. The working classes are not without the knowledge that the affairs of this Great Empire of ours require to be managed by men who have had some better training for the work than that of organizing a branch of a Trade Union, and making long-winded speeches, full of big words of doubtful suitability, and abuse of bloated capitalists. The result is that "Labour" candidates make but a poor show as a rule, even in an essentially working-class constituency; and no fund to maintain a large number of "Labour" members, such as the Unions are trying to promote, will make much difference in the result.

It is a thousand pities that these labour leaders will not devote themselves to studying the real facts of the industrial position of this country, and to leading the men into paths of economic wisdom and industrial efficiency. That the commercial prosperity of the country in the future depends upon the rightful solution of the labour problem—the improvement of the relations between employers and employed, and the consequent increase of our productive and manufacturing capacity—becomes more apparent every day to the thoughtful student of affairs here and abroad. Mr. J. Stephen Jeans, speaking at the annual general meeting of the South Wales Institute of Engineers the other day, remarked that, as a member of the Commission appointed by the British Iron Trade Association to visit the United States and inquire into the conditions of industrial competition, he went over between thirty and forty of the leading works in that country, and had opportunities of interviewing many prominent men associated with the iron, coal, and engineering industries; and everywhere he heard the same opinion expressed—namely, that the great difficulty England had got to face was that of labour. And just as the thinking man becomes convinced of the necessity of grappling with this difficulty, so does he become more and more certain it will have to be solved in spite of, and not by means of, Trade Unionism. Such addresses as that of Mr. Muirhead to the Scottish Trades Union Congress only help to strengthen this conviction.

ELECTRIC LIGHTING MEMORANDA.

The Challenge of the "Electrician"—What is the Duty of Incandescent Electric Lamps?—Laboratory Results—The Crystal Palace District Gas Company's Circular Justified.

THE challenge given in last week's "JOURNAL" to our respected contemporary, the "Electrician," to state what responsible electricians really hold at present to be the exact relative economical positions of incandescent electric and incandescent gas lamps, has not been taken up. The current number of the "Electrician" refers to the subject; but in so jejune a manner that the response is utterly unworthy to be called an answer to the question. It is stated that examination of our position reveals the fact that our "notion of electric light efficiency is limited to the 8-candle power incandescent lamp consuming 4 watts per candle." This is precisely what we did not say. On the contrary, we dismissed these small lamps as "night-lights," declared there is no business done in them, and said that "nothing less than nominal 64-candle electric lamps are of the slightest use for a shop window alongside another lighted by incandescent gas." How does this statement bear the representation that we are anxious "to compare large things with small ones"—that is to say, the performance of a Welsbach burner with an 8-candle power lamp taking 4 watts per candle—in order to make out our case for gas lighting? "Perhaps," says the "Electrician," with a fine affectation of having the best of it, "our contemporary will be satisfied to compare lamps of equal candle power; and in that event we may call its attention to the Nernst lamp, the efficiency of which is something better than '4 watts per candle.'"

Well, now, what is the meaning of all this beating about the bush, instead of telling us at once what is the average effective lighting duty of a nominal 64-candle power incandescent electric lamp of the ordinary kind on a town circuit? If it is not 4 watts per candle, what is it? We do not know better, and ask for information. Nor are we singular in our ignorance. Our contemporary thinks fit to refer us to the Nernst lamp. We have read in its own excellent reports of the meeting of the Birmingham Local Section of the Institution of Electrical Engineers, held on March 19, the latest that any outsider knows about the Nernst lamp. Dr. Morris, who communicated the paper, concluded his contribution to the discussion "by asking for information as to the average expenditure of watts in an ordinary glow lamp per candle-power obtained during its average life, *as it was difficult to obtain information about the power absorbed in the glow lamp under ordinary conditions of use.*" So that if we are among the uninstructed in this regard, we are in good company.

What is more, Dr. Morris's question remained unanswered on this occasion—and since, so far as we know. The author of the paper on the Nernst lamp, Mr. R. P. Hulse, had tested the new make of lamp under the regular conditions prevailing in the laboratory of the Birmingham University; and he found that, with all the careful regulation he was able to give it there, it yielded 0·48-candle power per watt expended during its 400 hours of average life, "as against 0·28-candle power per watt in the case of good glow lamps." And these latter, it should be observed, were not 8-candle power lamps, but a 40-candle power lamp. Now, 0·28-candle power per watt, obtained under these laboratory conditions with a "good" glow lamp—that is, of course, a selected lamp—is not, we admit, quite 4 watts per candle power. It is exactly 3·57 watts per candle. If the difference is sufficient to support our contemporary's fine scorn, we gladly make the "Electrician" a present of it. But, really, it must do us the justice to admit that all we know of the subject we obtain from diligent perusal of its own and similar reports upon such matters. And in the same place where we find this 3·57 watts per candle for a picked 40-candle incandescent lamp used under laboratory conditions, we also learn, on the authority of Mr. Henry Lea, Chairman of the meeting, that the conditions "inseparable from a large distribution system, such as we have in our towns and cities," are anything but equally favourable to the lamps. Mr. Hulse also admitted that his figures given for the ordinary incandescent lamp "were such as to make the best possible case for it," and that although when run on a perfectly steady pressure it will burn a long time, at the end of the time it would also be taking a large amount of power, "probably 6 watts per candle power, or even more." Why does not the "Electrician" fall foul of Mr. Hulse for thus "giving the show away"?

Lastly, there is this very circumstance that our contemporary, after a fortnight's rest to recover its health from the shock administered by the Crystal Palace District Gas Company's circular, can do no more than bring up in support the Nernst lamp—a new-fangled thing which is not in general commercial use; and probably never will be, if one may speak after Mr. Hookham, who confesses that he is very disappointed with it. Mr. J. C. Vaudrey also said the same thing in other words. To return to the place from which all this argumentation started, therefore, the initial fact remains that the comparison of the electric incandescent light with Welsbach gas lights is as the Crystal Palace Gas Company stated it, and as we justified the computation. Our data have not been upset, nor will they be on the "Electrician's" own showing, unless the Nernst or some other improved electric lamp can be relied upon for this purpose. As regards existing electric lamps, judgment goes against them by default.

WELSBACH SELF-INTENSIFYING LAMPS.

WITH high-pressure gas lights and self-intensifying gas-lamps there is a remarkable similarity in the duty obtained per cubic foot of gas consumed; but it is a mystery to some men as to why this should be, seeing that in their essentials or characteristics there is such a great divergence. Yet the fact remains that, though in one form the gas is supplied at an increased pressure at the gas injector nipple and in the other at ordinary pressures, the efficiency of both, per cubic foot of gas, approaches, in a surprising degree, an equivalent level. Therefore it is not astonishing to occasionally hear the question, Why is it? The answer as we understand it is simple. The object of increasing the gas to a high pressure is to obtain a jet of gas of sufficient aspiring force to draw in the necessary quantity of air for its complete combustion. In self-intensifying lamps, instead of doing this—instead of giving a jet under pressure—a converse condition of things achieves the same end. Partly by means of the construction of the burner head, and partly by means of the chimney superposed above the burner, a slight vacuum or a *minus* pressure is created—in other words, a pressure slightly below the atmospheric pressure is obtained in the bunsen tubes, and so air is drawn in with an increased velocity, resulting in a mixture which secures complete combustion. An accompanying effect is that in both systems—the high-pressure and the self-intensifying—a flame of great intensity is condensed within a mantle of ordinary size, and so from the mantle one gets as high a duty as is possible. For example, we have within the past few days seen a new self-intensifying lamp (which we are about to describe) at the offices of the Welsbach Incandescent Light Company which for its operation requires a mantle equal in size to, but of stronger construction than, the mantle used with the No. 7 Kern burner, which consumes from 7 to 10 cubic feet of gas. With the new burner, about double the quantity of gas that is consumed in the ordinary No. 7 burner is used; but the pressure at which the gas is supplied is the ordinary, and the mantle is not increased in dimensions, and yet the duty obtained per cubic foot is considerably enhanced. In the case of self-intensifying lamps, the great velocity of the current of air over the surface of the mantle, of course, has the effect of stimulating the incandescence. This, in a few plain words, is an explanation of the difference between the two systems, and more especially of the means by which the high efficiency is obtained in the newer of the two forms of lighting.

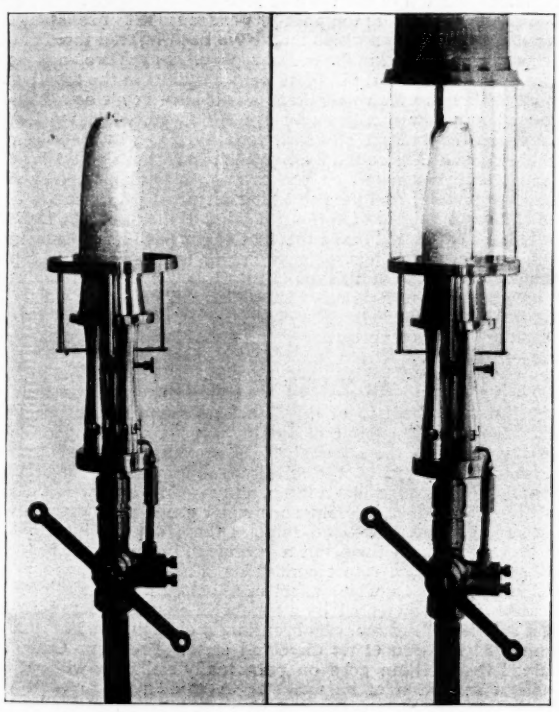
It is some time since we noticed the first form of the Welsbach self-intensifying lamp, in which, with a consumption of 10 cubic feet of gas, a lighting power of 280 candles or thereabouts is obtained. Meanwhile, the Engineers of the Company (Messrs. C. G. Brett and F. Henneberger) have not been idle; and they have now produced a burner which consumes about 20 cubic feet of gas at ordinary pressures—between (say) 1½ and 3 inches. The qualifying word "about" is necessary, and, of course, the consumption varies a little according to the pressure. But to give round figures, with a 20-feet consumption, an efficiency of 30 candles per cubic foot is obtained with the new design of lamp, or a total of 600 candles. Photometrical tests, we are assured, have given results above this; so that the Company and the inventors

are satisfied as to the truth of their claim. We have seen the lamp in operation, alone and in comparison with the old form; and, if anything, the new one strikes us, from a mere visual test, as exceeding double the power claimed for the smaller type. It is, indeed, a very powerful light.

When the complete specification of the patent for this burner is published, it will be found that the following is the gist of the descriptive part:—

On a hollow base supplied from the ordinary gas service at ordinary pressures are fixed four circularly arranged bunsen tubes (of the Kern type), each provided at its base with a central gas-inlet and lateral air-inlets. These tubes all open at their tops into a conical chamber of perforated metal—the bottom of the chamber being of sufficient diameter to accommodate within it the mouths of all the tubes, while the top of the chamber is of a diameter reduced to that of the interior of the flame. Outside the chamber is a taper casing, the bottom of which is slightly larger than that of the perforated cone, while its top has a diameter equal to that of the outside of the flame. Over the annular space between the tops of the cone and of the casing is fixed the annular burner outlet in the form of a toothed wheel, giving passage for the mixed gas and air through the spaces between its teeth and a narrow annular space beyond the teeth. Within the chamber of perforated metal, there is fixed a central tapering tube, open at the top and the bottom, so as to give free passage of air to the interior of the flame.

Over the burner is fixed a tall metal chimney, having at its lower part and surrounding the flame a cylindrical glass, the lower edge of which rests on a gallery. This gallery is adjustable in height, being supported by four rods and arms on a boss fitted to slide on an upright, at any part of which it can be held by a setting screw. On the casing is fixed an angle ring of such diameter as to leave an annular passage



THE NEW SELF-INTENSIFYING LAMP BURNER.

for the air to ascend between its outer edge and the inner edge of the gallery.

The draught caused by the chimney increases the volume of the air entering the bunsen tubes, so that a large quantity of gas and air thoroughly mixed passes through the perforations of the cone into the space in the casing surrounding it, and thence rises through the burner outlets to form a self-burning flame. By the draught, also, air is drawn into the interior of the flame through the central tapered tube, and into the glass around the exterior of the flame, the effect of these internal and external air currents being to give the flame such a form and such an intensity that, as it plays on a mantle suspended over the burner, it produces a light many times exceeding that which can be obtained from a burner of the ordinary incandescent type employing a mantle of like dimensions.

This is a description, couched in the usual patent phrase, of the new self-intensifying burner and its auxiliary parts; but we may elucidate it a little by amplifying some of the main features. The reason that a group of four bunsen tubes is employed is that, if only one was used, to get a high efficiency it would have to be so long and bulky that it would be hardly practicable for many lamps. The four tubes, as stated, are surmounted by only one burner head; and it is a special feature that through this burner head there is a central air supply, so that the interior of the flame is furnished with air for combustion. The perforated cone inside the head of the burner brings about a thorough mixture of the air and gas, and prevents lighting-back. There is also the usual toothed wheel as in the other forms of the Welsbach-Kern burner. The ring which is fitted on to the burner head, and forms with the gallery an annular space for the outer air supply to the flame, performs, simple though it is, a rather important function. The ring is really an air-deflecting device. Its upper surface extends about $\frac{1}{4}$ inch from the burner; and this extension prevents a direct upward flow of air to the flame—the flow instead passing obliquely on to what may be termed the hyper-incandescent zone of the flame. In addition to this, the annular air-inlet thus formed gives a uniform current of air to the flame all round. The bye-pass tube is carried through the centre of the burner head, terminating inside the mantle almost level with the circular ring of the head.

The sliding glass holder, too, has noteworthy advantages. It is simply held in position by a thumb screw; and this is an illustration of one of the pleasing features of the burner and its auxiliary parts—that all the constituent pieces can be disconnected for cleaning or any other purpose without labour or tools. Supposing, for example, the lamp attendant wants to renew the mantle, or clean the glass or burner, all he has to do is to loosen the screw (holding the gallery in position meanwhile), and then lift the burner off its cone joint at the bottom. In this way, the labour attached to keeping the burner in order, is about as little as it could possibly be. The glass cylinder, which is supported by the gallery (between which and the cylinder is an asbestos ring) is 6 inches high and 4 inches diameter; and it terminates in a flange in the bottom of the metal chimney in a manner to be described when explaining the improvements in the smaller type of self-intensifying lamp. The metal chimney is 24 inches long and 3 inches diameter.

We think that what is here stated is a sufficient description of this enlarged form of self-intensifying lamp, which gives the remarkably powerful light to which we have referred. To say that

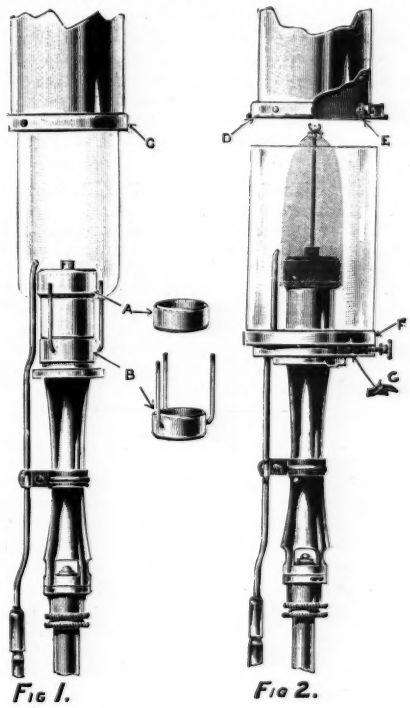


FIG 1. FIG 2.

it is a distinct advance in high-power gas lighting—an advance in that by such simple means and with such a moderate consumption of gas, such a handsome result is obtained—is not saying too much, nor is it saying anything which we need fear time will prove to be extravagant.

Now about the improvements which have been made in the smaller and older type of the Welsbach self-intensifying lamps. As originally designed (see fig. 1), the glass was $4\frac{1}{2}$ inches long and about $2\frac{3}{8}$ inches diameter. It terminated in a little flange at the top; the glass being suspended from the metal chimney by means of the flange and a ring fitted into a bayonet joint. This form has proved satisfactory in most cases; but in a few it has been found that, if the lamp was not fitted quite vertically, and one part of the glass was brought in consequence into close proximity to the mantle, it got fused or cracked at that particular part. It was therefore decided that it would be an improvement if a larger glass was adopted; and at the same time an advantage if a simpler form of holder for the glass was devised, in order that it might be removed and replaced without endangering the mantle or the glass itself.

In the improved form, the glass is a straight cylinder, $4\frac{3}{8}$ inches long by 3 inches diameter. It is supported on an adjustable glass holder on the burner head; and its upper part fits into a flange piece on the bottom part of the chimney. The holder is simply fixed in position (as in the large new lamp) by a screw, which tightens on to a clip, so as to prevent any mutilation of the burner head. In the old lamp, too, the air-inlet was not a constant; but the alteration admits of a number of holes being drilled through the base of the gallery, so that a constant air supply is delivered to the flame. The lamp is provided with a

wind-proof top, which has been found very effective in all kinds of weather. As in the new large form of lamp the change has brought with it ease in the operations of cleaning and maintenance; and, from this point of view alone, the improvements will be regarded very favourably. It may be explained that fig. 1 shows the burner and glass as originally designed; and fig. 2 the burner with the new form of glass in the lowest position ready for the removal of the burner from the cone joint. The old style can be readily altered to the new. By taking off the thickening ring A and centralizer B (fig. 1), the holder F can be fitted over the head of the burner (as in fig. 2). The thickening ring must be replaced, and the centralizer discarded. The curved clip G fits over the terminal of the thumb-screw, and this (as already explained) prevents the latter from damaging the head of the burner. Then the bayonet ring C (fig. 1) must be removed, and a new form of ring D (fig. 2) fitted. The ring D is provided with three screwed cones, which fit into the present bayonet slots of the metal chimney. When the ring is in position, the nuts E are tightened, so as to fasten the ring securely. It will be seen that, in this way, anyone who has the old form of lamp in use will have little difficulty in bringing it to the improved state.

PERSONAL.

Mr. E. H. MILLARD is severing his connection with the City of Durham Gas Company at the end of June. He has been Manager of the works since 1893.

A vacancy in the auditorship of the Bombay Gas Company having occurred, the Directors have chosen Mr. LOUIS PENNY, who was for many years their Manager at Bombay, to fill it.

Much sympathy has been expressed with Mr. W. R. CHESTER in his serious illness; and in reply to inquiries we learn that since last the matter was mentioned in our columns no improvement has manifested itself, but, on the contrary, as late as Thursday last the doctor reported that the patient was gradually getting weaker.

At the meeting of the Institution of Civil Engineers last Tuesday, Mr. C. H. PRIESTLEY and Mr. J. H. WHIELDON were transferred from the class of associates to that of members. The former is Water Engineer of the Cardiff Corporation, and he was President of the British Association of Water-Works Engineers two years ago. Mr. Whieldon was formerly assistant to Mr. Henry Rofe, M.Inst.C.E., under the old Nottingham Water-Works Company. He constructed the new water-works at Pernambuco, Brazil, and was afterwards engaged on a number of water-works in South Africa. He is now in practice as a consulting water engineer in Johannesburg.

OBITUARY.

The death is announced (at the early age of 37) of Mr. F. G. ALEXANDER, Assoc.M.Inst.C.E., who for a considerable time was engaged on the construction of works for the water supply of Belfast, and for two years had charge of important operations at Newcastle (Co. Down), in connection with the Mourne scheme.

Mr. JOHN BENNET, ex-Provost of Leith, died at his residence there on the morning of Tuesday last, at the age of 82 years. He was for many years a member of the Leith Town Council; and for the six years during which he was Provost of the burgh he was, *ex-officio*, Vice-Chairman of the Edinburgh and Leith Gas Commissioners.

A well-known Scottish contractor has lately passed away in the person of Mr. JOHN POLLOCK, of Glasgow, who died at Crieff, in his 68th year. He was engaged for many years under Mr. J. M. Gale, the Water Engineer of the Glasgow Corporation, in connection with the Glasgow and Loch Katrine Water-Works. He carried out large water schemes for the Corporations of Dundee, Perth, and Dumbarton, the Falkirk and Larbert Water Trust, and also the extensive sewage disposal works at Barrhead.

The "James Forrest" Lecture.—The tenth "James Forrest" lecture was delivered last Wednesday evening, at a special meeting of the Institution of Civil Engineers, by Sir William Roberts-Austen, whose subject was the "Relations between Metallurgy and Engineering." In the course thereof, he pointed out that more than half of the past century had elapsed before the age of steel began, and towards the end of the century great attention was devoted to considerations connected with its molecular structure and properties. When metallurgists gave engineers mild steel, they provided a cinder-free solid solution of iron and carbon. All subsequent advance had been due to the recognition of this fact, and to the study of the properties of metallic solid solutions. Sir John Hawkshaw, in his presidential address to the Institution delivered in 1862, said that if the strength of iron could be doubled, the advantages might be equal to the discovery of a new metal more valuable than iron had ever been. This was exactly what metallurgists had done with regard to steel, by proper thermal treatment, and by suitable additions of comparatively rare metals. A vote of thanks to the lecturer was proposed by the President, Mr. Charles Hawksley, and seconded by Sir Frederick Bramwell.

NOTES.

Hoisting Steel Chimneys.

The familiar manner of putting gasholders together in successive rings was exactly reversed in the erection of five steel chimneys, 125 ft. high, and 5 ft. 3 in. in diameter, for the British Westinghouse Company, at Trafford Park, Manchester. The plan followed was to erect a scaffolding, with a couple of tall poles for "legs," upon the cast-iron bed plate prepared to receive the chimney; and underneath this the top ring of the chimney was assembled and riveted together. When finished, the ring was hoisted up its own height, and the second ring put together beneath it; and so on. Thus the chimney was made, and hoisted as it was put together. The advantages of the method, as described in the "Engineer" by Mr. W. Stanton, are that the assembling and riveting is done on the ground, where it can be done properly, while scaffolding is much reduced. It is believed that this is the first time that steel chimneys 125 feet high have been put up in this manner; and it is not surprising that there were many prophecies of disaster in connection with the experiment. As already remarked, however, the method is only a reversal of the manner of constructing gasholders on the ground.

Bye-Pass Lighting of Incandescent Street-Lamps.

It is well recognized that the value of the gas consumed by the widely used pilot-jets for igniting incandescent gas-burners is very considerable, even when street lighting only is in question. Statistics collected in the town of Meerane, in Saxony, show that the cost of maintaining the pilot-jets exceeds that of renewing all mantles and chimneys which may have been injured through the burners being lighted in the ordinary way. In the twelve months ending March 31, 1901, pilot-jets were not used in the town; and 187 street-lamps which were kept alight until 11 o'clock at night required 557 new mantles and 272 chimneys, while 136 lamps which were kept alight all night, required 498 new mantles and 226 chimneys. Hence the lamps which were burning during the evening only consumed on the average 2·98 mantles and 1·45 chimneys apiece; and those burning all night 3·67 mantles and 1·66 chimneys apiece. On the other hand, the pilot-jets, if used, would have consumed 0·28 cubic foot of gas per hour apiece, or a total, for the 323 lamps, of very nearly 800,000 cubic feet per annum. The value of this quantity of gas far exceeds the cost of the whole of the renewals of mantles and chimneys when the pilot-jets were not used. The difference is, of course, greater in Germany—where mantles are relatively cheap and gas relatively dear—than here.

An Exhibit of Radium.

At the recent soirée of the Société Française, the principal attraction was an exhibit of fine separated radium, shown by the discoverer of the element, M. Curie. As described by the Paris correspondent of the "Daily Telegraph," this substance shone in a dark room like a lamp, and remains luminous without wasting. Moreover, it influences some other substances—zinc sulphide, for instance—and renders them equally luminescent by exercising upon them not a chemical, but a purely physical influence. Thus, a retort containing zinc sulphide was made brilliantly luminous, which effect would endure for about a week, because it was connected by a tube with another retort containing a solution of radium, which, curiously enough, was not in itself luminous by reason of its dissolved state. Professor Curie explained that radium goes on perpetually radiating without the smallest reduction of its weight. A small particle of it will render luminescent a volume of zinc sulphide a thousand times its size. Its weight would not be affected thereby. Moreover, on the removal of the entire quantity of radium, the zinc sulphide would remain luminous. Radium, never found in Nature in a state of purity, is as yet very costly. The small piece exhibited by M. Curie, not quite a cubic inch in bulk, is worth about £400.

Limitations of High-Speed Engines.

Discussing the subject of high-speed engines, the "Engineer" remarks that the question of their merit has not yet been finally settled. This type of steam-engine has of late years attained great popularity in England; but the fact that America and the Continent of Europe have not followed the fashion to any marked extent, is stated to have created, if not a reaction, at least a disposition to reconsider the matter in this country. In defining a high-speed engine, it is laid down that any piston-speed over 600 feet per minute, and any rotary speed over 300 revolutions per minute, may be termed high. The aim of high-piston speed is to get as much power as possible from an engine of given bulk and cost, inasmuch as, other factors remaining the same, the horse-power increases proportionately to the piston speed. High rotary speeds were introduced in order to secure the advantage of direct coupling for fast-running machinery and the abolition of belting. There are limitations and drawbacks, especially the trouble of knocking, due to the reversals of the direction of the piston movement. It is finally concluded that, owing to this and other troubles through acceleration, large horse-power per unit of bulk of engine is not possible with high rotary speed. This seems to be a way of stating that there are limits to the size of quick-running engines which cannot be safely overpassed. Consequently, all the large power generating stations of modern engineering must be fitted with slow-running engines.

TECHNICAL RECORD.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Half-Yearly Meeting in Newcastle.

The Fiftieth Half-Yearly Meeting of the Association was held in the offices of the Newcastle and Gateshead Gas Company on Saturday last, under the chairmanship of Mr. MATT. DUNN, of Goole, the President of the Association. There being a special attraction in Newcastle at the present time, in the shape of an exhibition of gas appliances, which most of the members visited either before or after the meeting, there was a much larger attendance than usual.

The PRESIDENT submitted the accounts for the year. They had all, he said, perused the statement which had been issued by Mr. Penney, their Hon. Secretary; and it was very gratifying. There was a balance in hand of more than £15 over and above last year. No doubt this was due to the energetic efforts of their esteemed friend Mr. Penney.

Mr. E. H. MILLARD (Durham) moved, and Mr. I. WALTON (Corbridge) seconded, the adoption of the accounts, which was agreed to.

NEW MEMBERS.

The following were proposed for membership of the Association: *Members:* Mr. B. Arnold, Secretary, Knottingley Gas Company; Mr J. Wilkinson, Superintendent, Sheffield Gas Company; Mr. E. H. Hudson, Manager, Normanton Gas-Works; Mr. W. H. Martin, Secretary, Northallerton Consumers' Gas Company, Limited; Mr. W. Smith, Manager, Corbridge Gas-Works; Mr. W. White, Secretary, Crook Gas Company; Mr. A. F. Young, Manager, Cockermouth Gas-Works; and Mr. J. Lee, Manager, Cornforth Gas Company. *Associates:* Mr. J. Wilson, Messrs. Wilsons and Mathiesons, Limited, of Armley; and Mr. E. J. Willens, Assistant-Manager, Middleton Gas-Works.

The PRESIDENT said there would now be 175 names on the roll —105 members and 70 associates. A year ago the membership was 176. Since then there had been some removals by death, and there had been four resignations.

Mr. WALTON moved that the candidates proposed be elected. Mr. W. AIRTH (Morpeth) seconded, and the motion was agreed to.

OBITUARY NOTICES.

The PRESIDENT read the following remarks relating to deceased members: I have to refer, with great regret, to the sudden death of Mr. D. M. Nelson, who was one of our earliest members—in fact, I believe he was (with the late Mr. William Hardie and the late Mr. Charles Sellers) one of the promoters of the Association. He was always a prominent figure, and a regular attendant at our meetings. I well remember the noble service he rendered at the last meeting of the Association, held at Ripon in October last year, regarding which he wrote to me after stating that he had "most thoroughly enjoyed that particular meeting." Mr. Nelson first came before the gas world, I understand, as the representative of Messrs. Laidlaw and Sons, of Glasgow, with whom he remained several years, and afterwards practised as a Consulting Engineer and a supplier of gas apparatus generally. He arranged for a considerable amount of gas-works plant within my own personal knowledge; having assisted in the construction of several gasholders, gas plants, &c., for him, principally for the Colonies, when I was engaged with Messrs. Ashmore, Benson, Pease, and Co., many years ago, although I have more intimately known him during the last few years. More recently, Mr. Nelson was engaged largely in the presentation to the agricultural world of a substance called "Firtos," which is a gas-works product of a very fertilizing nature. It was in the pushing of this material that he may be said to have laid the seeds of a disease which carried him off; his attention at the Glasgow Exhibition to this matter seems to have broken up his former robust health. He contracted a cold on the 20th of November last, which he was unable to shake off, and departed this life on the 25th of the same month. Mr. Nelson was a good-natured, pleasant, genial man, and leaves behind him many friends who will miss his presence. He was always ready to help a friend, and to do a good-natured action, even though this might be at the cost of much personal discomfort. "*His memory will not soon fade.*"

Yet another loss which we have to deplore is that of Mr. James Whyte, who for some twenty years held the position of Superintendent of the Jarrow works of the South Shields Gas Company. He had had a thorough training in gas-works plant; having been previously foreman to Messrs. Hanna, Donald, and Wilson, of Paisley. His death is the more deplorable in that he died while in the execution of his duty. He received the injury from which he died, while superintending the erection of a crane on the gas-works quay, when the jib gave way and fell upon his shoulder—inflicting serious internal injuries. He was much liked by the people of Jarrow, and took a great interest in the Mechanics' Institute of the town. At the time of his death, he had been for many years a member of the North of England Gas Managers' Association, although his quiet and somewhat retiring disposition, no doubt, prevented him from taking an active part in the Association's affairs, either in the preparation of a paper or in the various discussions. He was only 54 years old at the time of his death.

I have also to refer, with profound regret, to the demise of an esteemed Past-President, and one of the founders of the Association—Mr. Charles Sellers. From the early history of the Association, he took a prominent part in its affairs, and was a notable figure at its meetings. He was elected a member of the first Committee appointed in 1877. At the third half-yearly meeting of the Association, held at Carlisle on the 5th of October, 1878, under the presidency of Mr. J. Hepworth, Mr. Sellers read an interesting paper entitled, "The Advantages to Gas Companies Carrying on the Gas-Fitting Business." At the fifth half-yearly meeting, which was held at Stockton on Oct. 4, 1879, under the presidency of Mr. W. Ford, Mr. Sellers addressed the meeting on the subject of "The Construction of Globes and Shades for Gas-Burners." Mr. Sellers became Vice-President in April, 1881. At the tenth half-yearly meeting, held at Newcastle-on-Tyne the 29th of April, 1882, under the presidency of the late Mr. Thomas Trewhitt, Mr. Sellers opened a discussion on "The Proposed Differential Price for Gas for Trade Purposes other than Lighting." At the same meeting, he was elected President of the Association, and at the eleventh half-yearly meeting, held at York, on Oct. 6, 1882, under his presidency, he delivered a most interesting inaugural address. It will be remembered that at the 46th half-yearly meeting of the Association, held at Newcastle-on-Tyne, on April 28, 1900, under the presidency of Mr. W. Doig Gibb, he (Mr. Sellers), in company with Mr. J. H. Cox, of Sunderland, was presented with a congratulatory address on completing his Jubilee with his Company. All along, Mr. Sellers manifested a keen and lively interest in the Association; taking part in its discussions and assisting materially at its social functions. He was always a popular member, and stood high in the estimation of all connected with the Association. He was kind, genial, and sympathetic in his nature. "*His memory will long be cherished by us.*"

Another well-known gas engineer who has passed away is Mr. William Carr, of Stalybridge, who curiously enough returned to labour and die in the town in which he first saw the light. Mr. Carr had a very varied and large experience, having started his working life at 12 years old in the Stalybridge Gas-Works. At 23 he was appointed Foreman at Beckton; and at 25 he was Gas Engineer to the Halifax Corporation, where he served 13 years. He then journeyed to Johannesburg and remained four years; but, alas, his health suffered, and he was obliged to return to England. In 1896, he became Engineer of the Stalybridge Gas-Works. His health, however, never fully returned; and he had several periods of absence, in the hope that he might be benefited. Alas, he died on the 9th of December last, regretted by all who knew him, and liked by every one. Though in the course of a debate he might not agree with one's own views, and expressed himself somewhat brusquely, still he had such sterling qualities that he had very many friends who keenly felt his loss. He was not a member of this Association, but was so well known and respected a member of the profession, that I cannot refrain from making these few remarks concerning him.

DISTRIBUTION—DEVELOPMENTS TO MEET RAPIDLY INCREASING CONSUMPTION.

The PRESIDENT called upon Mr. A. B. Walker (of Walker), from whom, he said, he had received no end of help during his year of office, to read his paper on "Distribution—Developments to Meet Rapidly Increasing Consumption." The paper was as follows:—

The developments recorded herein are those which have been actually carried out within the past six years, during which time the gas sent out has increased from 123,861,000 cubic feet in 1895 to 222,184,000 cubic feet in 1901. The area dealt with is that supplied by the Walker and Wallsend Union Gas Company —viz., the whole of the districts north of the River Tyne, between the city of Newcastle and the borough of Tynemouth, comprising the borough of Wallsend, the urban districts of Walker and Willington Quay, and the parish of Willington. The geographical features of each of the districts are practically alike. The lowest parts adjoin the River Tyne, from which there is a gradual rise towards the northern boundaries. It is along the banks of the river where the ship-building yards, the principal engineering, and other public works are placed; hence the location of heaviest consumption. Other public works of any importance in the area of supply are grouped at Walker Gate, in the north-west corner—comprising the engine and carriage sheds of the North-Eastern Railway Company, brass foundries, and kindred industries. With this exception, it is only the requirements of ordinary consumers that have to be met in the hinterland. Since 1895, there have been many new streets built in the district, especially in Wallsend. The streets now built or in course of construction bear out the fact—comparing the last two census returns—that during ten years the population of Wallsend almost doubled itself.

Before dealing with the increase in consumption, and the necessary extensions to the distributing plant, it may be well to describe generally the gas storage and principal mains available at December, 1895—the date of my appointment. The supply is drawn from two gas-works—one situate at Walker in the western part of the Company's area, and the other at Willington

Quay in the eastern portion. The carbonizing plants of each works were at that time practically equal. At the former, there was only one gasholder available, with a capacity of 150,000 cubic feet; while at the Willington Quay works there were two gasholders having a capacity of 100,000 cubic feet each. The Willington Quay holders practically balanced each other. The pressures of these holders were: Walker: Top-lift, 35-10ths; bottom lift, 50-10ths. Willington Quay: Top lifts, 30-10ths; bottom lifts, 45-10ths. At each works there was one 12-inch governor. In both instances the lines of the mains in the streets were at right angles to the main leading from the governor, and were connected by means of 12-inch T-pieces.

Starting from the T-piece at the Walker works, and in the direction of Walker Gate, there was a 6-inch main. This size was continued to Pitt Street, at which point two 5-inch mains were taken off, for the supply of Walker. At a point a short distance beyond this, the size was increased to 12 inches. It had been intended to lay this main from Byker Terrace to the gas-works; and the work was started late in 1895. For some reason, it had not been completed; but this was done early in 1896. At Byker Terrace, the 12-inch main was reduced to 8 inches; this size being continued to Walker Gate. The distance from the gas-works to the latter place is about 1½ miles. Reverting to the works again, a 12-inch main was carried in the direction of Wallsend to Fisher Hill, ½ mile distant. Here it was reduced to 8 inches, which size was continued for ¾ mile to Gerald Street,

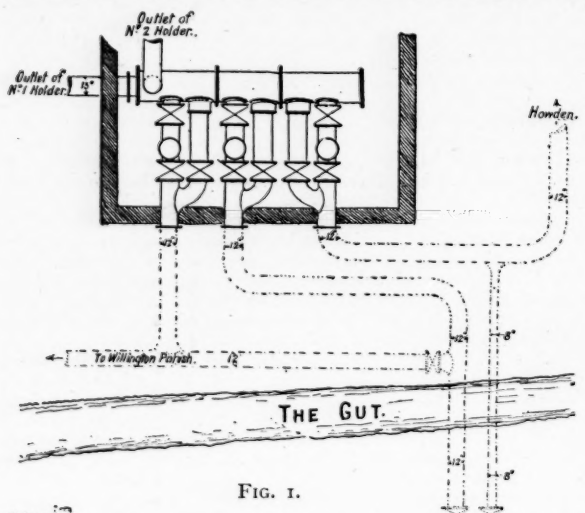


FIG. 1.

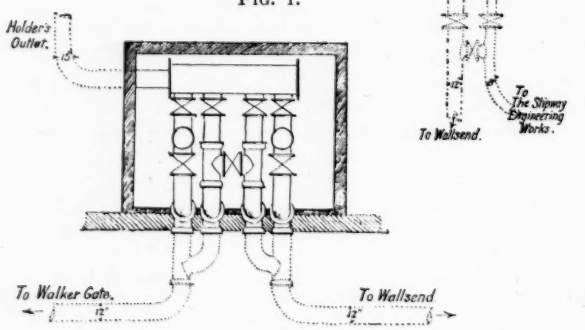


FIG. 2.

Wallsend; the feeders for the northern portion of the latter place being taken off *en route*. From Gerald Street, a 12-inch main was run to the Willington Quay works, 1¾ miles eastwards. This pipe is carried under the Willington Gut, a small tidal stream. When the pipe was laid, some six years previous to 1895, the original 8-inch main was left in from a point about 80 yards on the west side of the "gut" to the gas-works. These two pipes were connected as shown in Diagram No. 1; the valves being so arranged that, in the event of an accident to either pipe, the supply to Wallsend could be maintained through the other. Adjoining the gut, and on the east side of it, a 5-inch main was connected to the 12-inch main, and carried the supply to Willington parish. From the Willington works eastwards, a 6-inch main was run to supply Willington Quay.

The two works were therefore connected direct by one leading main 3 miles in length, composed of 2¼ miles of 12-inch main, and ¾ mile of 8-inch. On this pipe, between the works, two valves were placed—one on the 12-inch main at Carville Station, immediately to the east of Station Road, where the first main feeder for Wallsend was connected, and the other at Neptune Bank, on the 8-inch main, at the west end of Wallsend. These valves were used to regulate the supply from either works to Wallsend. In the event of Willington Quay supplying, and for some reason running short of stock, the west valve was opened and the east one shut, thus meantime drawing the supply from Walker. By reversing the valves, shortage of stock at Walker could be compensated for by Willington Quay. It was also possible, by leaving both valves open, to supply the whole district (though very inefficiently) from either works during the day. As both these valves were some distance from the works, and the state of affairs at each had to be ascertained before any alteration could be made (at that time there being no telephonic communication between the works), they were of little use to meet any sudden stoppage of supply. High Street—the principal street in Wallsend—had a 5-inch main on the south side, which was fed by three separate pipes from the 8-inch portion of the trunk main. Practically, all the other mains in the district were 3 and 4 inch ones.

Before dealing with the work of development, it may be of interest to consider the following tables.

TABLE I., *showing Total Quantity of Gas Sent Out and the Increase Each Year, the Average Maximum Demand per 24 Hours, and the Total Storage.*

Year.	Gas Sent Out.	Increase.	Average Maximum Demand per 24 Hours.	Total Storage.
	Cubic Feet.	Cubic Feet.	Cubic Feet.	Cubic Feet.
1895	123,861,000	..	No record.	350,000
1896	139,953,000	16,092,000	720,000	350,000
1897	151,543,000	11,590,000	800,000	450,000
1898	162,983,000	11,440,000	860,000	450,000
1899	182,984,000	20,001,000	920,000	450,000
1900	203,174,000	20,190,000	1,032,000	450,000
1901	222,184,000	19,010,000	1,150,000	750,000

This gives a total increase of 98,323,000 cubic feet, or roughly 80 per cent., in six years.

TABLE II., *showing the Respective Quantities Sent Out and the Percentage of the Whole from Each Works.*

Year.	Walker.		Willington.	
	Cubic Feet.	Per Cent.	Cubic Feet.	Per Cent.
1895	52,562,000	42·4	71,299,000	57·6
1896	55,346,000	39·5	84,607,000	60·5
1897	60,214,000	39·7	91,329,000	60·3
1898	54,936,000	33·7	108,047,000	66·3
1899	57,366,000	31·4	125,618,000	68·6
1900	74,983,000	36·9	128,191,000	63·1
1901	71,410,000	32·2	150,774,000	67·8

TABLE III., *showing the Quantities Consumed in Each District during Each Year, also the Percentage of the Whole.*

Year.	Walker.		Wallsend.		Willington Quay.	
	Cubic Feet.	Per Cent.	Cubic Feet.	Per Cent.	Cubic Feet.	Per Cent
1895	49,083,000	43·4	39,737,000	35·1	24,367,000	21 5
1896	57,770,000	45·6	38,850,000	30·7	29,862,000	23·7
1897	59,718,000	43·2	46,697,000	33·9	31,563,000	22·9
1898	62,004,000	40·8	57,294,000	37·8	32,407,000	21·4
1899	69,468,000	41·2	60,093,000	35·7	38,997,000	23·1
1900	76,651,000	41·2	66,325,000	35·8	42,728,000	23·0
1901	79,230,000	39·0	75,582,000	37·2	48,304,000	23·8

TABLE IV., *showing Percentage of Gas Used by Various Classes of Consumers.*

Consumer.	1895	1896.	1897.	1898.	1899.	1900.	1901.
Public works—							
Gas-engines	10·1	10 6	11·9	15·8	16·9	17·4	19·2
Lighting.	47·8	48·5	48·7	44·4	42·2	41·2	35·3
Ordinary consumers. . .	26·8	26·1	26·0	26·6	28·0	27 8	30·5
Automatic ,, . . .	1·2	1·7	2·2	2·7	3·0	3·8	5·7
Public lighting	14·1	13·1	11·2	10·5	9·9	9·8	9·3
	100·0	100·0	100·0	100·0	100·0	100·0	100·0

1896.—During the early part of this year, the pressure over the district generally was very fair; the only weak place being High Street, Wallsend and the lower portion of Willington Quay. This was due, so far as Wallsend was concerned, in several instances to small service-pipes, and in the majority of cases to consumers' fittings. The service-pipes were all renewed—nothing less than 1-inch pipe being used; hence complaints considerably decreased. As already mentioned, the 12-inch main from the Walker works to Byker Terrace was completed. Pressure readings were taken over the district generally during the winter, and showed a lack of pressure in the western portion of Wallsend and also Willington Quay. This year finished with an increase of 16 million cubic feet.

1897.—At the January meeting of the Directors, a report was submitted pointing out the necessity for increasing the carbonizing and storage plant, as the former was then working very near its full power and the latter was only 43 per cent. of the average maximum demand. A scheme for the ultimate development of the Willington Quay works was adopted; and as a first instalment, it was resolved to treble-lift the gasholders there, and also to regulate Wallsend and Willington Quay through separate governors; thus giving an independent supply to each. The 8-inch duplicate main to Wallsend was connected to the Willington Quay governor, so that in the event of any trouble occurring

with the Wallsend governor, by opening the valve connecting the two pipes on the west side of Willington Gut, Wallsend could be supplied through the 8-inch main. This arrangement also permitted of the supplying of Willington Quay through the Wallsend governor. The distributing chamber was constructed so that a third governor could be attached to same.

The adding of the third lifts to the holders was decided upon owing to there being no land belonging to the Company at Willington Quay on which to place a holder, and because of a proposal of some standing to erect a holder at Neptune Bank, Wallsend. Moreover, it would have been almost impossible to have completed the tank and holder for the incoming winter. It was also decided to run a 15-inch main in parallel with the existing 8-inch main which formed part of the connecting pipe between the two works—anticipating that the day supply to the whole district could be sent from Willington Quay, and at the same time giving a better foundation to feed Wallsend from. The increased quantity of gas sent from Willington Quay, and the more efficient supply to Wallsend, justified the foregoing anticipations. Another point taken into consideration was that, if the holder should at any time be put up at Neptune Bank, Wallsend, the 15-inch main would serve as the principal supply-pipe to the district.

The holders were completed towards the end of August. This gave an increased storage of 100,000 cubic feet, and, what was very important, this additional quantity was at 6 inches pressure. Telephonic communication was also installed between the works and my residence. This proved a great boon, and saved many an anxious journey between the works. Systematic observations of the pressures necessary to balance the two works were begun; and after this the valves on the trunk main were never used, except on very special occasions. The increase for the first nine months was about 12 million cubic feet; but the Engineers' strike during the autumn disorganized trade generally, and the actual increase for the year fell to 11½ million cubic feet.

1898.—The completion of the first section of the extension to the carbonizing plant at Willington Quay led to experiments in supplying the whole district from that place, with the result that not only the day load, but also the consumption from 11 p.m. to 6 a.m. was negotiated from there. The comparative quantities of gas sent from each works can be seen on looking at Table II. for this year; while Table III. shows that the bulk of the increase for the year was taken up in Wallsend. In the distribution department, the extension of service-mains and the increasing of the number and sizes of feeders to the north portion of Wallsend occupied the principal part of the summer.

In October of this year, an engineering works close to the west side of Willington Gut installed gas-engines of about 130 brake horse power. The 8-inch duplicate pipe across the gut was extended, forming the supply-pipe to the engines. The gas was taken from the 12-inch main, by leaving the connecting valve open and keeping the valve on the 8-inch main shut. On the east side of the gut there were already in use gas-engines of some 50 brake horse power, fed off the 5-inch main to Willington parish. This consumption, due to these engines at practically the initial point of supply, affected the pressure in Wallsend and Willington parish during heavy lighting hours. Since the introduction of the separate governor for Willington Quay, however, an excellent supply had been maintained in that district with a reduced pressure at the works; and it seemed feasible to supply the 130 brake horse power engines through this governor. This was done by opening the valve on the 8-inch main on the west side of the gut, and closing the connecting valve. This proved quite satisfactory.

1899.—The beginning of 1899 showed that the consumption was still on the rise, and more gas-engines were being installed in the lower part of the Willington parish district. As already mentioned, from the 5-inch main feeding this part, some 50 brake horse power of gas-engines were being supplied. An additional 100 brake horse power was being installed; and to meet this, a 12-inch main was laid in place of the 5-inch. This, however, was a 12-inch off a 12-inch; and although the worst of the winter was past, it was affecting the supply to Rosehill parish and also Wallsend. The Rosehill estate was also in the hands of the builders, and several new streets were then to be constructed. This was originally a small district which had been previously well supplied, but owing to difference of altitude, at a loss to Wallsend, also extending eastwards. Notice had been given, too, for a supply of gas to another 100 brake horse power engine in the lower part of this district.

This addition, it was quite evident, would place the Wallsend supply much where it was the previous year; and it was resolved to form Willington parish into an independent zone, with a separate governor at the Willington Quay works. This was done, and a 12-inch main carried to the works installing the large engine. At the same time, the Willington parish district was divided from Wallsend by means of a valve near the point where the original connection was taken off (see Diagram No. 1). A study of Table II. will show that the bulk of the increase of 20 million cubic feet was dealt with from the Willington Quay works.

1900.—The average maximum demand per 24 hours had risen to 920,000 cubic feet; and the top lifts of all the holders were of no use so far as supply during the hours of the heaviest consumption was concerned. Moreover, the demand in the Walker district had increased so much that it was quite a common occurrence to start with the gasholder full at 3.30 p.m. and to lose the bottom lift at 5.30 p.m.; while by 11 o'clock, probably two plates in the top lift was all that was left. The reason for this was the increasing demands at Walker Gate, to which it has already been pointed out an 8-inch main conveyed the supply.

Increased storage was absolutely necessary; and instructions were given to erect a new holder at Walker. An 80-feet holder was the largest that could be put on the land available; and a three-lift holder, with a capacity of 300,000 cubic feet, was decided upon. It was too late in 1900 to have this completed for the same winter; but to ensure being ready for the winter of 1901, the tank was commenced and finished in November, 1900. At the same time, two governors replaced the one at Walker, and the Walker Gate supply was divided from Wallsend (see Diagram No. 2). This was a most beneficial arrangement, as an increased pressure could be carried in the former district without having to carry the same in the latter, as previously; the result being that Willington Quay could send out more at its maximum pressure than before. The price of coals, however, was responsible for an increased send-out from Walker. Another increase of 20 million cubic feet was recorded for this year.

1901.—In the beginning of 1901, further anticipated consumption at Walker Gate and the alteration of the main road, made it necessary to overhaul the mains in this direction. As a result, a 12-inch main was laid; and whereas previously an initial pressure at the works of 5 inches was necessary, an increased consumption is being dealt with during the maximum demand by 3½ inches. The new holder was also completed early in the year, and but for this addition to the storage capacity of the works, it would have been a very hard task to have supplied the district of Walker Gate efficiently. This year finished with an increase of 19 million cubic feet.

It will have been noticed that, although the consumption has increased so much, practically all the increase has been manufactured at Willington Quay. It will also have been perceived that the storage at Willington Quay is 300,000 cubic feet, while that at Walker is 450,000 feet. It may therefore not be out of place in this paper to signify the present methods of working.

It has already been mentioned that all the requirements of the district are supplied from Willington Quay, except during the heavy lighting hours. In this way, all the gas made during these times at Walker is put into stock at Walker. Towards the week-end, the spare beds of retorts are worked so as to ensure there being about one plate in the bottom lift of one of the Willington Quay holders, and the other practically empty on Saturday at noon, when the public works are shut down. At Walker, the old holder is well down (the gas necessary for the district being in the new one), the bye-pass valve is shut, and the Walker Gate governor regulated. The full weight—6 inches—is put on the trunk main at Willington Quay; and this pressure is sufficient to raise the top lift of the old holder at Walker, which gives 3½ inches pressure. To allow a clear way, the governor bye-pass on the Wallsend main is full open; thus connecting the distributing chamber direct to the trunk main. The pressure, however, is not sufficient to raise the new holder at Walker; but as soon as the old one is filled, the gas is drawn from it and pumped into the new holder by means of a Sturtevant blower driven by a gas-engine. That the pressure on the mains may not be disturbed when this is being done, the gas-engine which drives the blower is governed to a speed which gives 3 inches pressure at the inlet of the blower. As an additional precaution, the ignition light of the engine is taken from the inlet side of the blower, and is so regulated that, if the pressure drops below 1½ inches, the bunsen burns back, and sufficient heat is consequently not developed to cause ignition.

It will be seen from Table IV. that something like 50 per cent. of the consumption is due to a day-load—public works and gas-engines. But for this, it would be practically impossible to supply the quantity of gas with the present apparatus.

The division of the district into zones has made the existing gas-holders and mains capable of dealing with a largely increased consumption. In this division, the position of the works and the geographical features of the district have been taken advantage of. So far as was possible, the work has been carried out in such a way that further increases can be met without rendering obsolete the plant already laid down.

No mention has been made of the gas unaccounted for, because of alteration, on various occasions during the period under review, of the times for surveying meters. But a fair comparison between 1895 and 1901 is obtainable. In the former year the figure was 8·34 per cent., and in the latter 7·27 per cent. It will therefore be seen that, although working at higher pressures, the unaccounted-for gas has decreased.

Discussion.

Mr. E. H. Millard (Durham) said he was afraid the amount of detail which was given in the paper was almost too much for the members to grasp in the few minutes at their disposal; but there were one or two points upon which, perhaps, Mr. Walker would give them his reasons for adopting the course he had taken. One thing which struck him was that possibly there might be some trouble occasioned by putting the full pressure of 6 inches on the main from Willington Quay to Walker. He did not know whether Mr. Walker had met with any difficulty from the exceptional difference in the heights of the two places. Another point upon which he would like to have information was the length of time over which the maximum consumption extended. From the

nature of the district, he should imagine it would be a somewhat erratic one. If the works were not kept going all night, but were closed at a given time, there would be all the difference.

Mr. T. Bower (West Hartlepool) thought the paper was hardly one which lent itself to much discussion; but there were one or two noticeable facts in connection with it which had been very interesting, at least to him, and to which he would like to draw attention. There was Table IV., showing the percentage of gas used by various classes of consumers. He thought that if Mr. Walker had done nothing else, he had laid the members under some obligation for pointing out how, in certain classes, various decreasing consumptions had been met by others which had increased. Gas-engines had increased from 1895 to 1901 from 10·1 to 19·2 per cent. It was true in the author's district there might be special facilities for this; but, on the other hand, this only indicated what could be accomplished by fostering the consumption, and doing all that they possibly could, by lengthening mains and giving facilities for the consumption of gas for motive power purposes, under the best conditions. Here, in the short space of six years, Mr. Walker had practically doubled his consumption for gas-engine purposes. It was true that he had lost 12 per cent. on the lighting of public works, which he had no doubt was due, in a very great measure, to the introduction of electric lighting in some large engineering and other works. It was practically the same in his own district. But if Mr. Walker had not increased his consumption for motive power purposes, he would have been left with a very large decrease, so far as public works were concerned. One very gratifying comparison was the increase of ordinary consumers. Nowadays, with the competition they had with the electric light, and other forms of competition, one might naturally expect that that branch of their consumption would decrease; whereas, in Mr. Walker's case, it had increased by nearly 4 per cent. over the six years. It was the same with automatic lighting; but in public lighting there was a decrease of from 4 to 5 per cent. He thought the figures bore out the experience of many other towns where electric arc lighting had been introduced for street purposes. A certain number of gas-lamps had been taken away in his own district; but he was glad to say that several of those which had been displaced had been fixed in other parts of the district, which was a rapidly growing one. He thought they should all thoroughly digest the figures before them, and, as far as they possibly could, lead them into their own districts. He thought that Mr. Walker was quite right in some of the steps he had taken as to reducing the risk of any one district being left without gas supply. He had a somewhat similar arrangement in regard to the borough of Hartlepool and the borough of West Hartlepool. They were entirely separate, but were coupled together by a somewhat similar arrangement. What Mr. Walker had shown them he had had to do, and he should endeavour to control them in a similar manner, because, in the case of Hartlepool and West Hartlepool, it occasionally happened that, through some accident or other circumstance, they had to be dependent for both towns upon one supply. Mr. Walker, he believed, had safeguarded his interests in that respect in every possible way he could. He thought they were much indebted to Mr. Walker for his paper.

Mr. H. Lees (Hexham) said that Mr. Walker had had the advantage of carrying out the works and knowing all the circumstances; and it might be presumptuous of those not knowing the circumstances to criticize the work he had done. Mr. Bower had drawn attention to a very interesting and important point. Probably it would not be very clear to some reading it in the public prints what Mr. Walker's figures meant. There had not been a decrease in the consumption in the departments given, but a decrease in the percentage of the whole. For instance, in 1895 there was consumed, for lighting public works, 47·8 per cent., which would be about 60 million cubic feet of gas for that purpose; and in 1901 the percentage consumed in lighting public works was 35·3, which would be about 80 million cubic feet. So that there had been an actual increase of consumption for the same purpose; while 1 per cent. of the whole consumption was less. The same applied to the other items. The increase of 17 million cubic feet in 1895 went up to 20 millions in 1901. It was a most interesting table, and one which showed that Mr. Walker and those who were associated with him had been endeavouring to cultivate a class of trade which was helpful to the district, and at the same time beneficial to the Company.

The President said he thought the whole of the tables in the paper were very good. He was a little amused when looking at Table No. 1. Mr. Walker had not then arrived at the termination of his paper; but he found that his average maximum demand for 24 hours was over a million cubic feet, and that his total storage was 450,000 cubic feet, which was about 40 per cent. of the maximum day's output. He (the President) was wondering what his experiences were about that time, with a limited storage of that kind. Of course, the figures would rather upset the ideas of up-to-date engineers, who had the notion that something like double the maximum day's output was a safe storage—most of them, he thought, 1½ times; but when it came down to 40 per cent., it seemed a very difficult matter to supply anything like the quantity required. No doubt, Mr. Walker had had his troubles—in fact, this was very much in evidence throughout his paper; but he had overcome them very well. He (the President) felt very much indebted to Mr. Walker for his paper.

Mr. Walker thanked the members for the manner in which they received his paper. Mr. Millard asked the effect of the extra 6-inch pressure on Saturday and Sunday. Well, there was practically no lighting during Saturday afternoon or on Sunday—the only thing was cooking; and the general complaint in his district was that they could not get enough gas for the purpose. There were no gas-engines running, and practically no public works going, in which there were chemical processes requiring a finely regulated supply of gas; and he had had no complaints at all as to the extra pressure. The only part of it that he was afraid of was that he might be dropping some gas by the way—between Willington Quay and the works at Walker—by leakage. But complaints as to extra pressure had not come to him yet. Mr. Lees was good enough to explain the point that Mr. Bower raised upon Table IV. There was, as he said, an actual increase; and he was afraid that his having to be away south during the earlier part of the week was responsible for that not being more complete. But he could put into it the figures showing the actual quantities of gas consumed by the various classes of consumers in 1895 and in 1901. He could give the exact quantities for both years, so that they would see the actual increases. Regarding the increase of gas-engines, he thought that was a part of their business which had been very largely kept back, because gas companies would not put in large enough mains, and put them in free of cost to consumers, to encourage the consumption of gas by gas-engines. This was a point worth taking up. He thought that gas-engines should be considered, both as regarded laying larger mains and as to the amount of discount which owners of gas-engines should get over ordinary consumers. They put it as high as 25 per cent. The President was anxious to know how he got on during the heavy part of the winter. He thought that if he read the first paragraph in the paper about 1900, he would see that he could not very well go out and enjoy himself of an evening. He thanked them again for their reception of his paper.

The Construction of a Subway for Gas-Mains.

The next paper, by Mr. J. Bancroft, of Hull, was entitled "A Short Account of the Construction of a Subway for a Gas-Main under the Queen's Dock Basin, Hull."

The President said he was sorry Mr. Bancroft was unwell, and could not possibly attend the meeting. He (the President) believed he was the only one there who had seen the construction described by the author, and it had been thought fit that he should read the paper. He then read the paper, which will be found on p. 1090. He added that he could assure the meeting that the work carried out by Mr. Bancroft was well worthy of a visit. If any of the members of the Association should happen to be in the vicinity of Hull, and would advise Mr. Bancroft, he knew he would be delighted to show them the subway. It was well worth seeing. As regarded the leakage to which Mr. Bancroft referred, he (the President) failed to see that he had anything to complain of. The salt seemed to percolate through in about thirty places; but it was what they called a "weep," and it would get taken up as time went on. The thing was quite new, and the water drained away into the sump-hole as fast as it entered. He thought that Mr. Bancroft was making more trouble of the matter than really existed. The subway was a good length, and the water which accumulated week by week was very little. If Mr. Bancroft should be present at their next meeting, he (the President) was sure he would be very pleased to answer any questions that might be put to him on the subject.

A Dividend to Labour.

Mr. J. Holliday (Hull) was to have read a paper entitled "A Dividend to Labour;" but he was not present.

The President said he thought, as Mr. Holliday was detained in York on special business, the best course would be for the members to take the paper as read. He believed Mr. Holliday would prefer this.

It was agreed to take the paper as read. It will be found on p. 1091.

Vote of Thanks.

Mr. Lees proposed a vote of thanks to the authors of the papers. They were very much indebted to these gentlemen for the preparation of the papers. In the case of Mr. Walker, they saw the anxieties he must have passed through before he was able to put before them the information they had listened to. They regretted very much the absence of Mr. Bancroft—more especially on account of the reason for his absence. They also regretted the absence of Mr. Holliday, who had prepared a paper which, he felt sure, would have raised a discussion which would have been interesting. But a discussion in the absence of the author of the paper would be at a disadvantage; and he felt that the Committee were justified in taking the course which they had done. Perhaps on a future occasion the paper might come before them in some other form.

Mr. E. E. J. Anderson (Middleton), in seconding the proposition, said it was a great pity that Mr. Bancroft and Mr. Holliday were not present. Mr. Holliday's paper dealt with a subject which he thought that all gas managers would have to take into consideration soon, because it was their duty to look into every matter wherein they could make profit.

The motion was agreed to; the President remarking that the programme seemed to be a tremendous one for one meeting, but they were obliged to take the three papers, because four or five

were offered. They had two papers left over for the next meeting, and so they were in a very happy position.

Mr. WALKER returned thanks.

ELECTION OF OFFICE-BEARERS.

The following were elected office-bearers for the year:—

President.—Mr. A. B. Walker, of Walker.
Vice-President.—Mr. F. P. Tarratt, of Darlington.
Auditor.—Mr. C. H. Armstrong, of Walker.
Hon. Secretary and Treasurer.—Mr. H. Lees, of Hexham.
New Members of Committee.—Mr. T. H. Duxbury, of South Shields, and Mr. F. J. Bancroft, of Hull.

Mr. WALKER and Mr. TARRATT returned thanks.

Mr. LEES, in acknowledging his election, said, considering how ably the office of Honorary Secretary and Treasurer had been filled since the formation of the Association, he felt he was taking up a legacy which had considerable responsibilities. He would always do his best in the office, and he knew he could rely upon the support of the general body of the members.

THE RETIREMENT OF MR. PENNEY.

The PRESIDENT said that Mr. Penney did not wish him to do it, but he felt bound to refer to his resignation. There was not one of them who did not regret sorely that Mr. Penney had handed in his resignation. He had been approached many times during the past month, and asked if they could not induce him to stay; but Mr. Penney had shown them clearly that he was unable to carry on the work without letting something else drop, and they did not desire that, because they must remember that the office was an honorary one. He felt that it would be wanting on their part if they did not record on their minutes that they deplored very much Mr. Penney being obliged to resign, and that the best thanks of the Association be given to him for the excellent services rendered by him during the past five years in which he had acted as their Hon. Secretary and Treasurer.

Mr. BOWER, in seconding the proposition, said he did not think it needed many words from him to support what the President had said of Mr. Penney's labours for the Association. It was well known to every member how efficient and how painstaking he had been in everything he had done pertaining to the Association. At an early part of his career as Secretary, he was brought into very close touch with him; and he could speak from actual observation of the work he had performed for the Association.

The motion was agreed to.

Mr. PENNEY thanked the members most cordially for the kind way in which they had received the proposal, and for the flattering things which had been said of him. He had always felt a very great interest in the work; and, as a matter of fact, it was a source of considerable regret to him that he had to give it up. They all knew high pressure led to worry; and he was sure they did not wish him to be worried, and he did not wish the Association to be neglected in any way. The little he had had the pleasure of doing for the Association he had always received compensating favours and satisfaction for, which had enabled him to carry on the work with pleasure, and he hoped with acceptance to them.

THE RETIRING PRESIDENT.

Mr. WALKER proposed a vote of thanks to the retiring President. He thought that Mr. Dunn could lay claim to having had two special qualifications for the office. He had energy; and he thought he had shown that day a considerable amount of eloquence. They remembered, so far as energy was concerned, that he practically ran the Ripon meeting himself. They had an excellent meeting; and he hoped the Gas Exhibition that night would make a successful ending to Mr. Dunn's year of office.

Mr. J. HEPWORTH (Edinburgh) said it gave him very great pleasure to second the motion. They all knew Mr. Dunn's ability and energy and resource, and they had seen how ably he had brought these qualifications into the Chair, and how, with his qualifications, he had so well served the Association.

The PRESIDENT assured them that, although it had been a very busy year with him otherwise, it had been a great pleasure to him to conduct the affairs of the Association so far as he could in the capacity of President. Even although he had never occupied that Chair, he should always have had a liking to come into the North of England, which he regarded as his own territory.

PLACE OF NEXT MEETING.

It was agreed that, in accordance with the desire of the new President, the autumn meeting of the Association would be held at Wallsend.

This closed the business portion of the proceedings.

DINNER AND PRESENTATIONS.

The members and friends, to the number of over 100, thereafter dined together in the County Hotel, under the presidency of Mr. Dunn. After the dinner,

The PRESIDENT, in a few well-chosen remarks, presented to the Rev. G. W. Garrod, of Ripon, a handsome gold pencil case, as a token of their appreciation of his services to the Association last October, on the occasion of their visit to Fountains Abbey. The pencil-case bore a suitable inscription.

Rev. Mr. GARROD, in thanking the members and associates or the gift, said he had many times conducted visitors over what he ventured to call one of the grandest abbeys in the world; but he had never had so graceful a compliment paid to him as he had received from the North of England Gas Managers' Association. He mentioned that he was preparing a lecture upon the Abbey, with illustrations, and that one of the slides which he was to show was the photograph of the Association, which was taken on the occasion of their visit.

The members and associates had, in the short space of three weeks, subscribed for a testimonial to Mr. Penney. It took the form of a gold hunting watch, with massive albert chain, a silver salver, and a case of silver fish knives and forks for Mrs. Penney. The watch bore Mr. Penney's monogram on the back, and on the inside of the case was the following inscription: "Presented to J. H. Penney, Esq., by the members and associates of the North of England Gas Managers' Association, in recognition of excellent services rendered as Honorary Secretary and Treasurer of the Association, 1897-1902. April 26th, 1902."

Mr. J. H. Cox (Sunderland), at the request of the President, introduced the subject of the presentation. He said he was exceedingly sorry that Mr. Penney had found it necessary to sever his connection with the Association as Secretary. Without casting any reflection upon those who preceded or those who were to follow him, he was sure nobody had done his duty more carefully or better than Mr. Penney. He had been a long time a member of the Association, and he had held in it the highest offices to which a man could attain. The Committee had gone into the matter, and had unanimously resolved that his services should be properly recognized, and therefore they had agreed to present him with some token of their esteem and respect for him.

The PRESIDENT, in making the presentation, said he had no doubt the Association were losing a very good Secretary indeed—he thought one of the best of all secretaries. He asked Mr. Penney to accept the gifts as a token of the high appreciation by the members and associates of the manner in which he had discharged the duties of his office during the five years in which he had held it.

Mr. PENNEY, in accepting the gifts, said: I esteem it to be an honour and a pleasure to receive at your hands these generous and useful gifts—tangible tokens of your kindness. I had the privilege of being present at the formation of this Association at South Shields, some 25 years ago. Since then I have, by your kind suffrages, contributed to your Transactions, served upon the Committee, and filled the several offices of Auditor, Vice-President, President, and lastly that of Honorary Secretary and Treasurer. When I entered upon the latter office, I promised the then Committee to hold it for (say) three years. I have held it for five; and I should have probably continued to hold office—that is, with your concurrence—for a longer period, as our relations have always been of the most cordial and pleasant character. Pressure of work in other directions, however, compelled me regretfully to announce my resignation at the last Committee meeting. I have the consolation to know that I am not deserting a sinking ship, inasmuch as the Association is in a most flourishing condition, both with regard to finances, membership, and prospects. I also have the further consolation that, in accordance with the rules, I shall be able to act on the Committee as an *ex-officio* member during the next twelve months. Associations of this character are of great value to their members and associates, if they take advantage of the facilities offered. For some time past, we have been acquiring some very capable members and associates, and I feel sure that they will come forward and assist in promoting the welfare of the Association. They have good examples in the founders of the Association, who did much to establish it on a sure foundation. They have also a more recent example in those members who have to-day so ably contributed to our Transactions. This brings me to the important question of papers, because an Association of this kind must have mental food. When inviting members and associates to contribute to the Transactions, the Committee have frequently been met with the answer that about every subject connected with the manufacture, distribution, and administration of gas has been written upon and debated by the Association, and that, therefore, it is difficult to find a new subject, or even a new title for a paper. That is quite true; but I do not think there is very much in it. For instance, if we argue by analogy, take the case of an author who writes a book. In course of time he often brings out a revised edition, which is much sought after. Now we all know that many changes take place in the manufacture, the distribution, and the administration of gas. Hence a paper given on a subject that has previously been before the Association, dressed up in the newest garb and embodying changes up to date, would be very acceptable indeed. The worst than can be said of this Association is that when we have not had a full business programme we have gone in for pleasure; and quite right too. I take it that, as individuals and as an Association, we are all the better for it. I consider there is much value in the social side of this Association, because, meeting together periodically as we do on such occasions as the present, we are afforded opportunities of comparing notes and obtaining mutual information, which may prove of great service to us and to the companies we represent. A few years ago, it was debated by this Association whether we should not abandon the October meetings. I am glad to say the proposal was not entertained. Had it been adopted, we should have missed our pleasant meeting at Ripon, where we were favoured with an able and up-to-date address by the Chairman, and enjoyed exceedingly our excursion to Fountains

Abbey, the pleasure of which was so much enhanced by the kind assistance of our good friend the Rev. Mr. Garrod. I may say, in conclusion, that this watch will be my daily companion, and the salver and knives and forks will from to time be brought into requisition by Mrs. Penney; and when we look at them, we shall be reminded of the pleasant circumstances under which they were received. We shall ever cherish them, and ultimately pass them down as heirlooms to those members of the family who know how to appreciate them.

The President said it was the sincere wish of all the members of the Association that the new venture of the Newcastle and Gateshead Gas Company (referring to the Gas Exhibition) should meet with the success which it deserved; and he thought it was their duty to take notice of the very valuable services which their friend Mr. W. Doig Gibb had rendered in promoting it.

Mr. Gibb recognized the kindness of the reference, but disclaimed the whole credit for the undertaking, which, he said, was chiefly due to the untiring exertions and skill which his colleague, Mr. Lewis, had brought to bear upon it.

At six o'clock the proceedings terminated. By this time a number of the members had left for home, having long distances to go. Most of the remainder repaired to the Gas Exhibition in Olympia, where the stall-holders had made great preparations to receive them; but, unfortunately, being Saturday evening, the crowded condition of the building afforded them little more than opportunity for a somewhat superficial view of the exhibits.

A SHORT ACCOUNT OF THE CONSTRUCTION OF A SUBWAY FOR A GAS-MAIN UNDER QUEEN'S DOCK BASIN, HULL.

By F. J. Bancroft, B.Sc.Lond., Assoc.M.Inst.C.E.,

Engineer to the Hull Corporation Water and Gas Department.

[A Paper Read before the North of England Gas Managers' Association.]

By the Kingston-upon-Hull Corporation Act of 1897, the Hull Corporation acquired the Kingston-upon-Hull Gaslight Company —a Company manufacturing over 100 million cubic feet of gas per annum upon less than an acre of land immediately adjoining the Town Hall, and in the centre of the city. The Corporation considered it imperative to cease manufacturing gas on this site, and to pull down the works and clear the ground for purposes of street improvement. They therefore obtained power in the above Act to enter into an agreement with either or both of the remaining Gas Companies supplying the city for the supply of gas in bulk to the Corporation for distribution within the area of the Company acquired. The Corporation having entered into an agreement in December, 1898, with the British Gaslight Company, Limited, for the supply of gas, the writer was instructed by the Water and Gas Committee to prepare a scheme for bringing the gas into the Old Town, which is encircled with docks and the River Hull.

Plans were prepared for crossing the Queen's Dock at the lockpit and at the basin, and for the pipes to be laid bare in the bottom and also within a subway. The North-Eastern Railway Company's Dock Engineer considered it undesirable to take the pipes across at the lockpit; but the Company were willing that the pipes should be carried under the basin. The writer advised his Committee that the only thoroughly satisfactory and permanent method would be to lay an 18-inch main inside 8 feet vertical shafts to be constructed of cast-iron cylinders on each side of the basin, and through a horizontal subway of 8-feet cast-iron cylinders, at a depth of about 16 feet to the top below the lock cill—*i.e.*, a total depth of about 40 feet from the ground level to the top of the subway. A 3-inch trial bore on the south side of the basin gave the following strata:—

Description.	Thickness.	Depth from Ground Surface.
	ft. in.	ft. in.
Made ground	8 6	..
Sandy clay	2 0	10 6
Stiff warp and clay	11 6	22 0
Clay	3 0	25 0
Strong warp	5 0	30 0
Soft warp	6 0	36 0
Clay	24 0	60 0

From this, it was expected that a satisfactory bed in which to construct the subway would be reached at 36 feet. In the construction of the work, to obtain good clay cover over the tunnel, the top was kept down to 43 ft. 9 in. below the ground.

The Corporation bought two shops with land at the rear, upon which the meter-house was constructed, to enclose the station meter, the meter for the water-main to the Old Town, and the north shaft. The mains, both gas and water, pass under one of the shops. The south shaft is not enclosed, the cast-iron cover and entrance manhole being on the basin side. A contract was entered into with Mr. B. Robinson, of Hull, to execute the whole of the work in the shafts and subway, except mains, for £3480. The essential parts of the specification to which the work was executed were as follows.

Shafts and Subway Lining.—The two vertical shafts, one on each side of the Queen's Dock Basin (the one on the north side being upon property belonging to the Corporation), shall be formed by sinking cast-iron cylinders of 8 feet internal diameter to the depth shown on the drawings. The subway shall be formed by driving horizontally from the above-mentioned shafts under the Queen's Dock Basin, and lining the excavation as it proceeds with cast-iron cylinders 8 feet internal diameter. The subway is to be driven simultaneously from each shaft; and great care must be exercised by the contractor, so that the two drivings meet in a perfectly straight line, both horizontally and vertically. The linings, where they proceed from each vertical shaft and where they meet each other, are to be connected by means of special castings jointed together, so as to form a perfectly water-tight lining. The Engineer shall have power to order the contractor to leave in any or all timber used in the work; and the contractor shall not be entitled to extra payment therefor. The contractor must take all responsibility for the nature of the strata, water, and all conditions in the way, and above and below the shafts and subway, and allow for driving the subway by means of shields and compressed air if necessary.

Leading Cylinder.—The leading cylinder of each vertical shaft shall be $1\frac{1}{8}$ inches thick, and have its cutting edge strengthened inside. It shall be provided with an internal flange near the bottom; and a bottom plate, of cast iron, $1\frac{1}{8}$ inches thick, in segments as shown, is to be bolted on after the cylinder has been sunk to the required depth.

Thickness of Cylinders, Flanges, &c.—All the other cylinders of the shafts and for lining the subways are to be 1 inch thick. All cylinders are to have transverse and longitudinal flanges $1\frac{1}{4}$ inches thick and $4\frac{1}{2}$ inches wide, machined 3 inches in width, with bolt-holes for $\frac{7}{8}$-inch bolts, 6 inches and 7 inches apart centre to centre; the horizontal subway lining to be provided with cast-iron keypiece, as shown on drawings. The special castings to form the junction of the shafts with the subway are to be strengthened with brackets, as shown.

Grouting in Portland Cement.—Each of the segments of the horizontal cast-iron lining to have two 1-inch holes cast therein, through which portland cement grouting is to be forced under compressed air, at a pressure of 30 lbs. per square inch, so as to obtain a solid backing. Plug holes at completion with oak wood plugs.

Joints.—The whole of the joints of the shafts and linings are to be formed by inserting between the flanges of the segments red lead or other approved jointing material. The flanges are to be securely bolted together with $\frac{7}{8}$-inch bolts, and are to be caulked with rust cement, so as to exclude the ingress of all water, as the contractor will be required to leave the whole of the work perfectly water-tight. [N.B.—Large joints were made with lead wire plaited.]

Top Cylinders.—The top cylinders of each shaft are to be provided with flanged inlets, specially cast (in positions to be ascertained hereafter), for the 18-inch gas-main, 12-inch water-main, and the spare 18-inch main.

Bed upon Top Cylinders.—A tooled York stone circular curb 9 in. wide by 6 in. deep, dowelled and rebated on top, and cut to receive cast-iron bearers, to be provided and fixed to carry strong cast-iron chequered and perforated plates, with hinged plate for opening, about 2 feet square, which is to be protected by a wrought-iron hinged safety grating to lock, so as to guard the opening when the top plate is raised. Provide and hang wrought-iron tray under perforated plate at south shaft.

Coating.—All the segments, after having been properly fettled and cleaned, are to be coated before oxidation has commenced. The coating to present a smooth glossy surface, be quite black, and be incapable of mechanical separation from the castings.

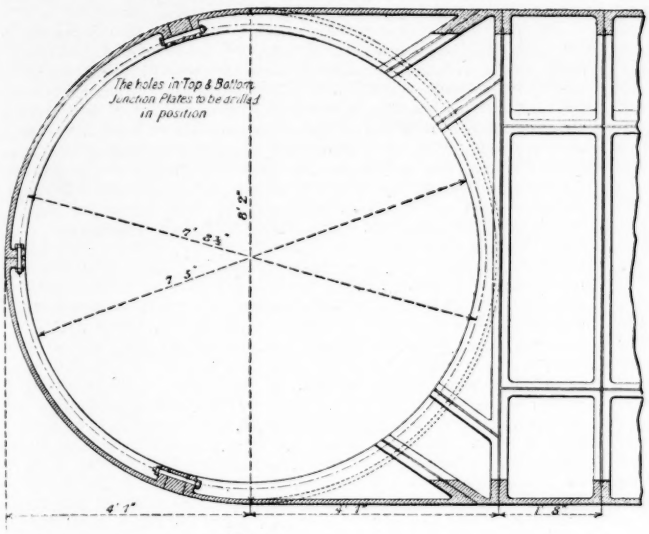
Landings and Footway.—Provide and fix 3 in. by 3 in. angle-iron bearers as required to carry 7 in. by $2\frac{1}{2}$ in. elm boarding, to be provided and fixed at the top and bottom of each shaft as shown, to form landings in the vertical shafts. Form and hang flap door in each landing. The boarding to be bolted to angle irons with $\frac{1}{2}$-inch bolts, heads to be let in flush. Lay portland cement concrete to form slope shown on drawings, for footpath through subway; the top to be formed with granite chippings and portland cement in the proportion of 2 to 1, and be floated to a smooth surface.

Ladder.—Provide and fix strong wrought-iron ladder from the entrance of each shaft to the bottom thereof, fixed to cylinders, and provided with necessary handrail at the top.

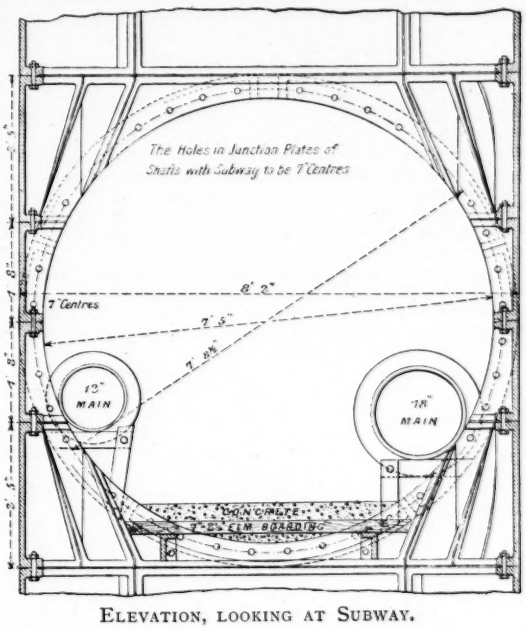
The south shaft was sunk plumb; but the north one is 4 inches out of the vertical, due entirely to the contractor allowing the cast-iron shaft to sink too far down the top guide timbers without adding additional segments. Attention is drawn to the construction of the junction castings, as shown. The shafts as sunk were, at the intended position of the junction with the horizontal portion, provided with special segments and a key-piece on each side. When the shafts had reached the total depth, the key-pieces were withdrawn and the segments taken out as required, and replaced by the special junction segments, which were all made wedge-shaped, so as to allow of being fixed one at a time. To assist in removing the circular segments and replacing them with the junction plates, the contractor also when sinking provided a 1-inch wood packing between the joints of the segments at the top of the junction plates. This was ultimately replaced by 1-inch cast-iron plates, with rust-joint at the face. Drivings were made from each vertical shaft, at the rate of 3 ft. 4 in. (two segments)

HULL CORPORATION WATER AND GAS DEPARTMENT—
SUBWAY, QUEEN'S DOCK BASIN.

JUNCTION OF SHAFTS WITH SUBWAY.



PLAN.



ELEVATION, LOOKING AT SUBWAY.

per day, and met within half-inch of each other. The subway is not quite watertight—a slight leakage occurs at one or two joints; but this has nearly ceased. There is also considerable condensation at times on the inside of the subway and on the pipes. The total water which collects in the sumps is at present 1 inch on the north side and 2 inches on the south side per week, and is pumped out by hand. The construction, which was completed by March, 1900, has proved entirely satisfactory.

The cost of the work was borne in equal parts by the Water Department and the Gas Department; the former having power to lay a 12-inch main through the subway into the old town, which formerly was dependent upon a single connection laid in the bottom of the Prince's Dock entrance about 1826. The Electric Light Committee at the time declined to take part in the work. They have, however, recently applied to the Gas Committee for permission to lay cables in the subway; and an agreement has been entered into, under which the Electric Light Committee have laid nine cables.

The terms of the agreement are as follows: (1) The minimum rent to be £20. (2) The rent per cable to be £4. (3) All work to be executed under the inspection of the Water and Gas Engineer, and to his approval. (4) A man to be stationed in the subway by the Water and Gas Committee during the execution of the work; his wages to be paid by the Electric Light Committee. (5) No entrance to be obtained without application at the Water and Gas Office, except in emergency. (6) No naked lights to be used. (7) No lifting, strutting, or any interference to be made to water, gas, or other mains already in position. (8) The Electric Light Committee to be responsible for all damage, direct, indirect, or consequential, occurring to the property of the Water and Gas Committee through the use of the subway and building. (9) Entrance to shafts for cables or pipes to be made watertight. (10) Position of cables, and mode of fixing and carrying, to be agreed to by the Water and Gas Engineer. (11) The cables to be shielded in such casing as the Water and Gas Engineer may approve.

"A DIVIDEND TO LABOUR."

By Mr. J. HOLLIDAY, of Hull.

[A Paper presented to the North of England Gas Managers' Association.]

The Chairman of the South Metropolitan Gas Company, at the close of his communication to the Institution of Gas Engineers in October, 1892, on the "Failure of the Wages System of Payment, and the Remedy—Profit-Sharing," concluded with the following piquant inquiry: Who will enter upon this inheritance? The inquiry relates perhaps not so directly in this instance to the principle of profit-sharing as to the gains to be effected by the adoption of a system whereby a healthy spirit of goodwill and confidence is engendered betwixt employer and employee.

The study of profit-sharing as an economic principle will, I am well aware, bear deep probing, away from its "face value;" and much has been said and written by political economists respecting the correct interpretation of the word "profits." What are they; and how are they fairly to be divided? It is my desire to-day to place before you—crudely it may be—a few ideas on this matter in relation to the administration of gas undertakings particularly, and to the labour question generally. Let us regard it from the point of view of the gas company, leaving corporate administration and finance on one side.

In the first instance, we have two essentials to keep in mind: (*a*) Our duty to the capital providers—mortgage or debenture holders and shareholders; and (*b*) our duty to our customers, or the consumers. Both are protected to greater or less extent by legislation. Parliament, in its wisdom, has laid it down that the interest payable to the shareholders, &c., may be 10, 7½, 7, 5, or 3½ per cent. per annum, as the case may be, according to the class of stock held; but it must not exceed the maximum rate fixed. The reason for this, as you are aware, is that the consumer may not be required to pay, or be mulcted in, a higher price for his gas than is necessary to produce such a sum as will pay the full interest charges for the amount of capital invested, *plus* fair working charges, to meet the cost of production, &c. In the ordinary way, working charges, grouped under revenue account, include costs of manufacture, distribution, management, rates and taxes, bad debts, insurance, &c.; the surplus from this account being carried to profit and loss account.

In theory, this account (the profit and loss account) should balance itself at the end of each financial year—that is, the balance on the account should be a sum sufficient to meet the charges for interest, dividend, &c., only; any surplus being devoted to reducing the selling price of gas. Parliament has, however, gone a step further, and allowed companies to accumulate, in the combined interests of shareholders and consumers alike, certain funds—reserve or insurance—for the purpose of meeting any unforeseen expenditure which might, through a sharp increase in the prices of our raw materials (coal chiefly), or from any other legitimate cause, occur. The funds referred to (limited in amount) are therefore formed out of any excess profits—after providing for interest, dividends, &c.—on profit and loss account. When the funds reach the maximum amount allowed, we revert to the original position—that the surplus has to be devoted to the benefit of the consumers by reduced charges for gas.

Having thus roughly summarized the position, we will turn our attention more specifically to the making of the balances on revenue account, which are generally regarded as the profits on the working of the undertaking, and ask ourselves once more the question, What are "profits?" How much ground does the word really cover? I may explain that I am dwelling upon this point for a reason; and the reason, briefly, is that many people who are antagonistic to the principle of profit-sharing argue that when the labourer is paid his hire, all further responsibility or duty towards him, on the part of the employer, ends—morally and by the law of the land. In other words, if an employee is paid on a certain fixed day of the week or month, as the case may be (I do not confine myself to day labourers alone in this matter), at a certain fixed rate, agreed upon mutually between his employer and himself as satisfactory market-value for his services, and both sides carry out their agreement honestly, according to their lights, no more is due, or can be expected.

This premise I do not for one moment dispute; but the resultant, in practical matter-of-fact every day life—as needs no telling if we use our eyes—is frequently, I am sorry to say, dissatisfaction. And the reason for the dissatisfaction is not far to seek—it is simple. There is no mutual interest between employer and employee, no "community of interest," to use another well-known phrase. The effects of this are wide. The gas consumer suffers surely; the gas shareholder occasionally—but rarely as a shareholder. Both sides—employer and employee—wish to make the best of their bargain. The employer naturally conceives it to be his right to extract the maximum amount of work for the money he pays out in wages; and the employee, on his side, reduces his work, or the intelligence applied to it, more often than not to the

barest limits conceivable with retaining his position. No one I think will be disposed to argue that this condition of affairs is either an ideal one or one at all likely to conduce to the best interests of any commercial or industrial undertaking.

But how are we to mend it? On the side of the employee, undoubtedly, by the introduction of some system whereby his interest in his work is quickened. The shortest road here is through his pocket primarily. This may be a bald statement; but it is true. Show the stoker that he is going to gain something beyond his bare weekly wage, that he is going to possess a monetary interest in the concern he is working for, and he can gain this by a little more care in the working of his retorts; or show a mechanic or fitter that he can gain it by a more economical use of his time—in other words, give them personal self-interest in their respective work, and they will do it, and see that their fellow-workmen do it; and the result is bound to be beneficial. The introduction of little economies in the way indicated, as well as the adoption of broad principles, is a great factor in swelling balances and making the concern healthy and vigorous.

On the employers' side, the ground has already been broken for us in the gas industry; and the means, accordingly, are easily accessible and easily applied. The difficulty appears to be largely due to the slow rate at which the idea—for it is only an idea or sentiment at best, as experience has already proved—of the benefits to be derived from "splitting interests" permeates the minds of those in control in these matters. We have some few broad-minded and far-seeing generals among us, it is true; but the great majority apparently prefer to stand still and wait. It is a very necessary rule in industrial and commercial, as well as in other walks of life, to guard most carefully against the introduction of systems or schemes which may lead to any laxity in discipline or control; and I can quite understand the hesitancy with which many controlling powers view changes which they fear may lead to such a possibility and inculcate the idea in the mind of "Jack" that, being an interested individual monetarily, he may presume to rank as high as "his master." Experience has proved, however, that this danger need not be regarded as very material. The two forces can be made to, and do to-day, combine and work together to the mutual advantage of employer and employee.

I fear the term profit-sharing itself has much to answer for in connection with this feeling. Timid minds shy at the idea of the equality implied by the phrase; and some people further regard it in the light of a bonus, or even bribe, to the workers to smooth the way. My own feeling is that it is not, under all circumstances, perhaps the most happily chosen term. The word "profit" itself is apt to mislead as so applied; and the point comes in here—Have we quite fulfilled our duty to our trust, if we so manage an undertaking as to be in a position to work along year by year, paying our maximum dividends, paying our workers fair wages or salaries, and selling our gas at a fairly low average price (in comparison with our neighbours), or are we to strive for some stronger future position? We must never at the present day overlook for a moment the fact that we have competition, and strong competition, to fight; and in order to maintain our ascendency and keep progressing, we must not fail to avail ourselves of every possible means of strengthening our hold as suppliers of a good and economical medium to meet the requirements of our customers.

Here, then, we have the means (there are many others, of course) of saving on the cost of production, and devoting the saving so effected—because we cannot increase the shareholders' divisible profits when they have reached the maximum allowed—to still further reductions in the price of gas. Therefore I contend that the effects of paying "a dividend to labour," with its consequent good results, does not affect the matter of the division of "profits" as the word is usually accepted, except in this degree—it strengthens the prospects of these profits being, through the adoption of better business principles, maintained for a longer future period.

My view of the matter is that the introduction of any system whereby the whole of the workers participate in improvements wrought or effected by their better effort, carries us indeed a long way beyond the bare idea conveyed by the term "profit-sharing," and, further, is as much to be advocated from a business point of view as the adoption of any system whereby working expenses may be reduced by the introduction of more efficient types of machinery or plant, or any other scheme involving interest payment on outlay. Let us reason this from a purely financial standpoint. Surely the human equipment of any works is as important as the mechanical equipment; and, if so, must we not admit that we ought to make adequate provision for its mainten ance at the highest point of efficiency. You may possibly think I am carrying my argument far; but it is what I honestly believe to be the true position, and a fair manner of viewing that position. We are simply placing something—the workers' portion—against capital account, for which we expect, as we do from all capital charges, a fair return for our venture. Therefore, I say once again, the term "profit-sharing" is misleading to the ordinary individual—we are simply paying a dividend due to labour.

Mr. John Stuart Mill, in his "Principles of Political Economy," has said that one of the modes in which some system of combining interests tends to increase the productiveness of labour, "consists in placing the labourers, as a mass, in relation to their work, which would make it their principle and interest—at present it is neither—to do their utmost, in place of the least possible, in exchange for their remuneration." It is not my intention, nor is it necessary for me to-day, to go *seriatim* through the details or working of the various schemes whereby a dividend may be paid to labour. These have all been laid out for our information and guidance by more capable hands—men who have had actual experience in the inception and working out of such schemes.

That the wages system of payment will probably continue to exist for many decades yet, we may well believe; but it will probably become more diversified than at present. But, however slowly we move forward, I feel certain, from the indications of the times, that the adoption of the principle of paying a dividend to labour is only a question of time—that sooner or later it is bound to become general, as a necessary business measure. And the sooner we rid our minds of the idea that the said dividend to labour smells of an approach to danger to be incurred through lifting a man out of his natural sphere, or of confusing philantrophy and business, the better it will be for all concerned. The leadership of the competent will still survive, and recognition of merit in the mass will strengthen, not impair, the conduct of our operatives. And from this it follows that our duty as citizens of the world ought to lead us individually forward to study the question from all sides with an unprejudiced and impartial mind.

Antagonism between labour and capital in the gas industry has for some years now been fairly dormant; but this fact is no foundation upon which to build for the future. Let our guiding policy be to so influence our connections in the proper quarters as to make such struggles as we have seen in the past things of past history. Beneath nearly all labour troubles, the personal alienation of the employer to the men he engages to work for him, or his attitude towards them, bulks largely. Mr. Carrol D. Wright, the United States Commissioner for Labour, expresses this point very clearly: "I know of no trust more sacred than that given into the hands of the captains of industry; for they deal with human beings in close relation, not through the media of speech or exhortation, but of positive association, and by this they can make and mar."

In conclusion, I would say that if we neglect the study of the labour problem from all points of view, particularly the material as set forth by a dividend to labour, or the consequent moral, from the generation of a better feeling between man and man or employer and employed, it will come upon us again more suddenly than pleasantly. I have, on the invitation of our President, placed these views before you to-day, in the hope that they may germinate in your minds, upon one section of the problem at least—a section which has at the present moment, and will have in the future, a strong bearing on the relationship of capital and labour, and one which will tend to bring the two classes (employer and employed) into closer communion than has been, or is usually, the case, and cause Trades Unionism to become, for the purpose of securing as high rates of pay as possible, unnecessary combinations on the part of the workers of England.

The total anthracite output of the world is said to be about 840 million net tons, of which the United States is credited with 289 million tons, Great Britain with 246 millions, and Germany with about 155 millions. No other country sends out more than 50 million tons annually.

The subject of the composition of gaseous hydrates was recently brought before the French Academy of Sciences by M. de Forcrand. After remarking on the experimental difficulties in the determination of the exact composition of the hydrates of such a gas as sulphur dioxide, the author developed a new method, based on the fixed ratio between the heat of formation of the solid hydrate and the absolute temperature at which this hydrate has a pressure of 760 mm.

The "Engineering Record" publishes particulars of a factory building in reinforced concrete, satisfactorily erected in Jersey City. The factory is 50 ft. by 25 ft., five stories high, and is made wholly of 1:2:4 portland cement concrete, gauged very wet, with about 12 tons of twisted steel rods, from ¾-inch to 1-inch square, embedded in the 500 yards of concrete composing the building. The peculiarity of the structure is that it is all alike—foundation, walls, floors, and roof, without any heavy rolled steel members. The site was soft and wet, and accordingly wide footings were put in, until the calculated weight on the ground was about 2000 lbs. per square foot. The walls started 16 inches thick, and the floors are a continuous concrete slab 2½ inches thick, except in the first storey, which is 4 inches thick, supported on similar concrete joists spaced 26 inches apart at centres. These joists are 4 inches wide and 20 inches deep below the floors. The sand, broken stone, and cement were tipped by barrowfuls into a Ransome's concrete mixer, which was continuously driven by a gasoline engine. The mixer discharged (while revolving) into a simple elevator, consisting of a large bucket capable of being hoisted to the required height by means of a wire rope wound round a drum on the engine. The bucket tipped itself into a hopper on every floor, where wheelbarrows carried the concrete to the work. The twisted wires and rods were laid to be buried in the concrete in the usual manner, and were found to answer very well. The erection was very expeditious. The floors were laid out in batches of 16 feet square, and as many as 300 of these batches were put in within a working day of ten hours by a force of 14 hands, divided into 4 men at the mixer, 3 barrowmen on the scaffold, 4 rammers, 1 finisher, and 1 helper to make the granolithic surface to the floors, and an engine and machine man.

BYE-PRODUCTS COKE-OVENS IN AMERICA.

A specially interesting feature of the proceedings at the eighteenth annual meeting of the Ohio Gaslight Association, which was held in the Great Southern Hotel, Columbus, on the 19th and 20th ult., was a discussion on the subject of "Recent Developments in Bye-Products Coke-Ovens." It was evoked by a request sent by the Secretary (Mr. T. C. Jones, of Delaware), acting for the Programme Committee, to certain members to put forward their views on the question; and these came before the meeting in the form of three short papers, which were printed and circulated.

Dr. F. SCHNIEWIND (New York), who will be remembered by many of our readers in connection with the elaborate paper he contributed to the Gas Engineering Congress in Glasgow last year, opened the subject. He began by pointing out that coke-ovens had of late attracted the serious attention of gas engineers, as their use had made satisfactory progress in the United States; and he gave a list of those in course of construction by the United Coke and Gas Company, with which he is connected. It was practically the same as the one given in his Glasgow paper, and showed a total of 2453 ovens. He explained that the later plants have a daily charging capacity of 8 net tons of coal per oven per day; while the earlier ones vary between 5 and 6 net tons. The entire charging capacity of all these plants is about 14,350 net tons of coal per 24 hours. Having briefly described the process, Dr. Schniewind went on to deal with the residuals resulting therefrom. He remarked that from average coking coals the following yields are obtained: 75 per cent. coke, of which from 90 to 95 per cent. is foundry grade; 5 to 6 per cent. tar; 1 to 1·25 per cent. sulphate of ammonia, which is shipped either in the form of sulphate or of concentrated liquor; and from 4000 to 5000 cubic feet of gas of 18 to 20 candle power and about 700 B.T.U. per cubic foot. The coke could be employed for metallurgical purposes (blast-furnaces, foundries, &c.), or boiler firing, domestic purposes, &c. With regard to the first-named use, each gross ton of pig iron (of which 3,300,000 net tons were produced in Ohio last year) requires nearly a net ton of coke; and this needs the consumption of 1½ tons of average coking coal in beehive ovens, but only 1⅓ tons in bye-products ovens. The coal consumption for the above-named bulk of pig iron was therefore 4,950,000 tons, while in bye-products ovens it would have been only 4,400,000; showing a waste of 550,000 tons on coal account alone. If the 3,300,000 net tons of coke could be produced in bye-product ovens, the following quantities of gas, tar, and ammonia could be saved every year: Gas, 17,600 million cubic feet; tar, 220,000 net tons; and sulphate of ammonia, 44,000 net tons. In addition, there would be, as stated above, 550,000 net tons less coal consumed. Passing on to deal with the various residual products of coke-oven working, the author made the following remarks.

There is a crying demand in all large cities which are situated in or near bituminous coal districts for a smokeless fuel; and, on account of the high price of anthracite, we have no doubt that coke is destined to take the place of the more expensive anthracite, and of the unclean bituminous coal for all domestic purposes, in office buildings, &c. It should be borne in mind that oven coke is of a very superior quality as compared with ordinary gas-works coke, and that it is successfully used for many purposes where that coke has not met with any success. The prices of tar and ammonia have kept up very well, notwithstanding the large quantity of these bye-products which is now being produced by the various plants in operation. Most of the products of these plants have been sold on long-time contracts. The quality of the gas has already been mentioned. A net ton of average coking coal, yielding about 9000 cubic feet of gas, gives, on an average, 4000 cubic feet of surplus gas. If the first fraction of the gas is collected separately, these 4000 cubic feet have about 18 to 19 candle power without any enriching. The 5000 cubic feet of poor gas used for heating the ovens still have about 8 to 9 candle power. This is almost entirely due to benzol vapours, which can readily be extracted. Consequently, the candle power of the rich gas may be still further increased by adding this benzol. Of course, there is a limit in regard to the candle power of the gas, because coal gas of higher candle power becomes smoky; but we have found from actual experience that at Everett a 20-candle power coke-oven gas does not produce objectionable smoke. It is impossible to exhaust this subject in a short paper; but I have endeavoured to show that the bye-products coke-ovens are bound to come, both for the supply of coke to the Ohio blast-furnaces, and for the supply of smokeless fuel to cities. These ovens have for many years been in operation, and have been remunerative as coke producers only, even when the gas was wasted. This waste of the gas has, however, now been overcome, because the quality has been brought up to such a degree that even the best coal gas manufactured by the old retort process cannot be compared with it. As the erection of these plants in your district is bound to come, will the gas be wasted?

Mr. T. LITTLEHALES (Syracuse) contributed the following observations on the subject:—

An unusual opportunity having occurred to me for giving continued study, investigation, and observation to retort-oven working and results, advantage was taken of it, and the conclusions so reached are before my gas brethren in the paper I had the honour of presenting at the meeting of the American Gaslight Association in October last.* Before commencing investigating retort-ovens, there was a pretty strong conviction in my own mind that, as gas producers, they were simply "not in it" with retorts; and if that were all there is to the question—viz., ovens as gas producers—the same position might probably be maintained to-day. But that is not by any means the case. Other factors than gas production have so important a bearing upon the question, that one can safely use the old aphorism about circumstances altering cases; and it may not be out of place to indicate to you the facts that changed my former views on the ovens as compared with gas-retorts.

On looking into retort-oven working for the first time, the thing that will probably strike a gas man at once will be the fact that, from the time the coal reaches the siding in the cars until the coke is quenched, every part of the coal and coke handling is done by machinery, except the pulling of the levers to open and close the valves letting the coal into the charging lorries and again from these into the ovens. As he watches the filling of three lorries, each containing a little over 2 tons, in about three minutes, sees them emptied into the ovens almost as quickly, and, when the charge is burned off, sees the whole of the coke from (say) 6½ tons of coal pushed out and quenched in from 2½ to 3 minutes and the oven doors closed up again ready to be recharged in from 4 to 5 minutes, he will begin to realize that the ideal of all progressive gas men—to substitute machinery for the arduous labour of stoking—is about reached. The simplicity of the operations being such as to enable any ordinary labourer, without previous training or experience, to perform them satisfactorily, it will soon begin to appeal very strongly to his common sense and judgment, to say nothing as to his ideas as a manager in regard to its probable effect on the balance-sheet at the end of the year. It seemed to me to be so plain and self-evident, that the proverbial "blind man on a galloping horse" could almost see it.

The question will then arise about the relative areas of ground occupied, the relative cost of construction to the gas made, the fuel account, and the wear and tear charges, as compared with retort methods. Then, when all things are taken into account, and losses and gains considered, there will come the question: By which method can most money be made, and under what conditions can the ovens be advantageously operated? According to my figuring, when the whole thing was summed up, the advantage was largely on the side of the ovens. In short, given an outlet for coke, the oven operators could, at a fair profit, put gas into the holders at a price sufficiently lower than that at which a gas company could make it to have an important influence on the profits, or help in the reduction of the price to the consumer.

There do not appear to be any new facts or figures of importance to present to you, other than those given in my paper at Boston. That paper showed, from a United States Government report, that the coal used annually in the States for coke making was upwards of 30 million net tons (which was fourteen times as large a quantity of coal as is used in 433 cities and towns in making coal gas), and that the coke produced therefrom in coke-ovens amounted to about 20 million net tons. Assuming the recovery of 4000 cubic feet of gas per net ton of coal, at present wasted, it amounted to 120,877,372,000 cubic feet—more than sufficient to furnish twice over all the gas at present consumed in the 40 largest cities in the United States, allowing a consumption of 4200 feet per head of the population. That this was not over-estimated, it was shown from another United States Government report that the consumption in 433 various sized cities and towns in the United States gave a total quantity of coal gas, oil gas, and water gas made of 50,385 million cubic feet; while the waste, on the basis before indicated, was 120,877 millions. So the wastage would more than supply the 433 cities and towns twice over. The paper also showed that the further annual growth of coke making involved an annual increase in the gas wasted nearly sufficient to supply the output of 25 of the largest gas companies in Massachusetts with an actual average consumption of 2240 cubic feet per head per annum; and it appeared as though the question resolved itself more largely into one of the decentralization of coke manufacture than anything else, and of carbonizing the coal at the points where the waste gas and other products could be marketed.

You all know that an engineer, in laying out new plant for any purpose, is supposed to take all the conditions and peculiarities of that special situation into account, so as best to adapt things to the requirements of that particular case, in order to enable him to obtain the largest returns from the capital invested. Therefore, as soon as sufficient acquaintance with retort-oven working and results had been obtained, I started in this way: I assumed a large city situated at a distance, at which all the gas-making data—cost of materials, labour, coal, &c.—were available, and supposed that an extension of plant of a capacity of 2 million cubic feet per day had to be provided; also that a knowledge of what retort-ovens could do was desired. On this assumed basis, careful estimates were prepared of a coal-gas plant for 2 millions per day, and, given a certain price at which gas had to be put into the holders, a calculation was made as to what return should be obtained on the investment on the ordinary retort plan. The same course was pursued with the retort-oven equipment,

* See "JOURNAL," Vol. LXXVIII., p. 1594.

figuring everything out on similar or corresponding bases. The results showed that, under the conditions of that place, gas from the ovens could be put into the holders with profit at a price which would mean an absolute loss on gas-retort methods. The make was then cut down one-half—the estimate being made again on a million cubic feet per day; and the ovens still had the advantage as distinctly as before. Again and again the capacity was divided, and figured on each sized plant with different costs of coal; and in every case, given the disposal of the coke, the ovens were ahead. The data and calculations were submitted to people abundantly able to criticize them; and the soundness of my position and the correctness of my figures were admitted. The subject has been looked into from every standpoint I could think of, and there is always one condition that will enable a good retort-oven system to be operated successfully in very many places—viz., the disposal of coke; and seeing that retort-oven coke has been abundantly demonstrated to be fully equal to that produced from beehive ovens for metallurgical purposes, this goes a long way towards securing the necessary disposal of coke.

The main question, then, of the successful and profitable operation of retort-ovens is the disposal of the coke at a moderate price. Given this, all other difficulties can be overcome. The remarkable experience of one gas company in this State is well worth bringing to your notice. Notwithstanding that soft coal is cheap, the company, by wise policy and able management, have so developed the coke trade that not only do they find a ready market at satisfactory prices for all they produce, but purchase large quantities from other gas companies and from users of coke-ovens to supply the demand. What is done in one place can surely be done in others, if the same policy is pursued.

Many gas men who have seen retort-ovens in operation when the gas was not being marketed, and noticed the comparatively low illuminating power of the gas produced under those conditions—often not more than 8 or 10 candles—have gone away with the impression that this was the normal condition and quality of gas from these ovens; whereas it was only the result of conditions then prevailing, which could readily be changed if requirements called for this being done, because under those conditions the gas was of but small consideration. As a matter of fact, gas of just as good quality and illuminating power can, by proper working, be as easily obtained from retort-ovens as from gas-retorts; and by the separation of the gases—using the richer for lighting purposes and the poorer for heating the ovens—gas of considerably higher illuminating power can be obtained from the ovens than is generally obtained in gas-retort operations. This fact was discovered years ago, and has since been confirmed by practical operation. Analyses of the gases produced by the Paris, English, and New York Gas Companies, and of those from retort-ovens, show that they are all of the same general character in every respect.

While I do not for a moment wish to withdraw from the position previously taken—that the retort-oven is to play a very important part in the gas manufacturing industry of the future—I am inclined to think it will be safer and better for gas companies and oven users to work together on some equitable basis of co-operation to their mutual advantage, rather than for gas companies in the present stage to assume risks and responsibilities with which they are not yet familiar. Experience, which in many cases has been costly, is worth money, and often much more than money. Where conditions exist for such co-operation, gas can be put into the holders cheaper than the gas companies can make it for—often enough so much cheaper as to make an increase of from 2 to 3 per cent. per annum on a fair capitalization.

Mr. C. W. Andrews (Hamilton, Ohio) submitted the following remarks:—

Your Programme Committee have requested me to write a short paper in continuation of the subject of coke-oven gas, opened by Dr. Schniewind; and I feel that the most interesting way to present this matter to the Association will be to give a sketch of the results we are obtaining at Hamilton.

In 1900, we were confronted with the necessity of rebuilding our old plant, as we had outgrown its carbonizing capacity. As the maximum combined output of the city is at this time nearly 500,000 cubic feet daily, we decided that it would be a better policy to build large plant on the latest lines, of sufficient capacity to take care of the total outsend, and also of the probable increase for a number of years. After due investigation of the Otto-Hoffmann system, as installed by the United Coke and Gas Company, it was adopted as being the best for the conditions surrounding our location.

The Hamilton Otto Coke Company started the erection of their 50-oven plant in July, 1900, and the first charges of coke were pushed in the latter part of April, 1901; the plant, therefore, taking ten months to erect and put in operation. This was regarded as fairly good time, considering the state of the market. In the course of a couple of weeks' operation, we were able to begin the supply of gas to the Hamilton Gaslight and Coke Company, who had already made a contract with the Coke Company for its supply. We found that the illuminating power of the gas was subject entirely to our wishes, as we were able to maintain any desired quality up to 19 candles without any difficulty; and the calorific value of the gas above that produced by the retort process formerly used was very quickly demonstrated, as expressions of satisfaction were constantly received from our patrons. Had not a long and severe strike of the machinists interfered, we should have placed a very large number of gas-stoves in addition to those we sent out in our regular course of business.

During the first few months' operations, we made a very large percentage of domestic coke, for which a market has easily been found, not only in this vicinity, but also throughout the West and North-west. The foundry trade, which we expect to make our main business, was, of course, gradually worked up, until at the present time we have all the orders necessary to operate the plant on practically foundry coke; the quantity of domestic coke now made not being sufficient to supply our local demand.

The gas produced at the Coke Company's plant is conveyed by a 3-mile 8-inch pipe-line to the old works of the Gas Company, where it is purified in the usual way, and forced into their storage holders. In this connection, it might be interesting to know that we are using high-pressure exhausters for this service, which enables us to force gas at the pressure of 8 feet of water, if desirable. This, of course, removes most of the difficulties ordinarily contended with on low-pressure lines of this kind, as condensation or deposits of naphthalene can be forced out of any ordinary traps, and carried forward to the drip-pots.

As this is a new proposition in this part of the country, you will no doubt be interested to know what were the reasons which induced us to go into this method of manufacturing gas. Hamilton has two gas-works—one operated by the Hamilton Gaslight and Coke Company, and the other by the City of Hamilton—each having in conjunction an electric plant, so that either gas or electric light can be supplied as desired. The Company are, however, operating quite a large power circuit in addition, having more than 400-horse power in motors. Their station contains a gas-engine of 150-horse power, which is employed in connection with a steam plant for this service, as we consider it advantageous to use the gas in a large engine of this kind. The City of Hamilton put its gas plant in operation in 1889, at that time reducing the price of gas to $1. This was met by our Company making the price 95c., though the combined output at that time was only about 20 millions annually. From that time until 1895, the price remained at the figures quoted. In the latter year, the price was again reduced by the City to 80c. net, which step was met by our Company without any further reduction; and this price still remains in force. As a result of these low prices, the output of gas has increased amazingly, and with every indication of a continuous growth.

Since the erection of our plant, the South Jersey Gas, Electric, and Traction Company have started building a 100-oven plant at Camden (N. J.), which will be in operation early this summer, and will supply gas to a large number of New Jersey cities. The Maryland Steel Company are also erecting a plant of 200 ovens at Sparrow's Point, near Baltimore, the surplus gas from which will also be used for illuminating purposes. There are, therefore, four plants either in operation or under construction for the purpose of furnishing illuminating gas.

GOVERNORS ON SERVICE-PIPES AND BURNERS.

Herr F. Pannertz, Chemist at the Municipal gas-works at Crefeld, has lately reported in the "Journal für Gasbeleuchtung" the results of a study which he has made on the action of governors. The following is a summary of his report.

Three types of pressure regulating apparatus were examined—viz.: (1) Governors inserted in the service-pipe beyond the meter. (2) Burner governors for single-flame burners. (3) Burner governors for two flames. In addition, regulating screws attached to the burner for the purpose of precisely fixing the amount of gas which passes under a given pressure, were examined. Besides the amount of gas passed by the governors, the reduction of pressure, and the effect on the light given by incandescent burners, were also observed. Pressures higher than those which prevail in ordinary consumers' service pipes were also studied.

Service-Pipe Governors.

The regulation of pressure by a certain uniform weighting of the bell of the governor was found to be perfectly satisfactory for practical purposes. The fluctuations of pressure due to a gas-engine were also found to be greatly lessened by a governor on the supply-pipe. When the pressure anterior to the governor varied from 12-10ths to 38-10ths, the pressure posterior to it varied only from about 12-10ths to 13-10ths. Herr Pannertz considers, however, that it is wrong to place the governor after the meter; it should be before it, as the gas ought always to be measured under uniform pressure. He thinks that the insertion of a governor before the meter should be obligatory, and that both the gas-works and the consumer would benefit if it were so. Hitherto, most gas-works authorities have objected to a governor being placed before the meter, because they require an uninterrupted service-pipe from the main to the meter; but this objection might, he thinks, be readily overcome by having a governor permanently attached to the inlet of each meter. He is at present observing the effect which variations in pressure produce on the proper action of gas-meters.

The next observations were on the use of regulating screws in conjunction with the service-governor. The more important results are shown in Table I.

TABLE I.

Pressure before the Meter.	No Service Governor.					Service Governor Anterior to Meter.					
	Pressure after the Meter.	Without Regulating Screw.		With Regulating Screw.		Without Regulating Screw.			With Regulating Screw.		
		Cubic Feet of Gas passed per Hour.	Candle Power of Welsbach Burner.	Cubic Feet of Gas passed per Hour.	Candle Power of Welsbach Burner.	Pressure after the Meter.	Cubic Feet of Gas passed per Hour.	Candle Power of Welsbach Burner.	Pressure after the Meter.	Cubic Feet of Gas passed per Hour.	Candle Power of Welsbach Burner.
Tenths of an Inch.	Tenths of an Inch.					Tenths of an Inch.			Tenths of an Inch.		
38½	35½	6·29	29·7	6·29	29·4	11 8	3·53	47·3	12·2	3·38	48·9
27½	25	5·19	35·9	5·12	40·8	12·2	3·43	47·3	12·0	3·39	48·2
20	17½	4·34	40·8	4·22	44·0	12·4	3·51	47·3	12·0	3·41	49·7
16	14	3·74	45·7	3·69	47·3	12·5	3 53	44·0	12·0	3·38	48·9
14	..	..	..	..	..	11·8	3·43	45·7	11·8	3·32	47 6
12	10	3·11	44·5	3·04	46·5	10·0	3·16	44·0	10·0	3·04	45·3

The measurements of the light afforded by a Welsbach burner under the different conditions were made with a mantle which had been in use a long time previously. The results indicate, according to Herr Pannertz, that the action of the governor is very advantageous, and that the use of the regulating screw in conjunction with the service-governor exerts a very favourable influence on the development of light from the incandescent burner.

Single-Flame Burner Governors.

Burner governors are set to give a particular pressure, which cannot be altered, as can be done in the case of the service governors, by merely altering the weight on the bell. The burner governors tested only came into action when the anterior pressure was about 16-10ths. Herr Pannertz thinks it would be better if they came into action at 12-10ths or 14-10ths pressure. Table II. shows the results obtained with a single-flame street-lamp Welsbach burner, using a mantle which had been new half-an-hour previously.

TABLE II.

Anterior Pressure. Tenths of an Inch.	Pressure after Meter and Governor. Tenths of an Inch.	Pressure after Meter. Burner used without Governor. Tenths of an Inch.	Cubic Feet of Gas passed per Hour.	Illuminating Power of Welsbach Burner. Candles.
36·8	11·8	—	3·51	58·8
33·0	—	29·0	5·72	51·5
28·0	11 8	—	3·39	58·8
28 0	—	24·6	5·14	54·0
23·5	11 6	—	3·44	58·0
23·5	—	20·6	4 77	58·8
19 5	11·8	—	3·57	58·8
19·5	—	17·3	4·39	58·7
15 8	11 8	—	3 46	58·8
15·8	—	13·4	3·74	57·1
14 0	—	12·2	3 57	53·9
13·6	11·0	—	3·28	57·2

The governor evidently had a very favourable action on the amount of gas passed, and on the illuminating power. The fluctuations in the light with variations in the pressure which are so distressing to the eyes, were done away with.

Two-flame Burner Governors.

The ordinary two-flame Welsbach street-lamp burners were used with various nipples. The first pair of burners used without the governor consumed, at a pressure anterior to the meter of

24-10ths, 56 per cent. more gas than when used with the governor.
19½-10ths, 44 ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,
16-10ths, 20 ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,

A second pair, similarly used without the governor, consumed, at a pressure anterior to the meter of 23½-10ths, 31 per cent. more gas than when used with the governor; while the similar figures for a third pair were:

23½-10ths, 34 per cent. more gas than when used with the governor.
19½-10ths, 26 ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,

The utility of the governors in all these cases is very evident from the above figures. The two-flame governor was also tested when only one of the pair of burners was in use. At a pressure anterior to the meter of 23½-10ths, the one burner consumed 5·44 cubic feet of gas when used without the governor, as against 4·66 cubic feet when used with the governor.

Durability Trials of Burner Governors.

A single-burner governor was used in a lamp in a very exposed situation, adjacent to a lamp with a similar but an ungoverned burner. From the first there was a perceptible difference in favour of the governed burner, especially when the pressure rose about evening time; and this difference was maintained to the last. Practically, the same amount of gas was passed at the same initial pressures by the governed burner after it had been in use for 56 days as at first.

Herr Pannertz, being convinced of the advantage of setting the governor to give a low pressure, both from the point of view of economy of gas and of sensibility of action of the governor, then made some trials with governors set to give a pressure of 6-10ths. He found that the duty obtainable from the Welsbach burner at this low pressure was quite satisfactory. He then made some modifications of the burner governor, with a view to increasing its sensibility, while making it possible to reduce at will the pressure at which it acts. This improved burner governor, with initial pressures ranging from 10-10ths to 28-10ths, gave an almost constant pressure of about 6-10ths; while the rate of passage of the gas varied only from 3·57 to 3·67 cubic feet per hour. Four different varieties of mantles were tried with this governor on burners with nipples perforated to pass from 3·5 to 3·9 cubic feet of gas an hour under a pressure of 6-10ths to 8-10ths. The perforations were identical in the first two tests, but were different in the third and fourth. The results were as follows:—

Mantle No.	Pressure before the Governor.	Pressure after the Governor.	Gas Passed per Hour.	Illuminating Power Attained.	Duty.
	Tenths of an Inch.	Tenths of an Inch.	Cubic Feet.	Candles.	Candles per Cubic Foot.
1	16·2	7 5	3·74	71·4	19·1
2	16·2	7·5	3·74	60·5	16·2
3	16·2	6·1	3·84	67 5	17·6
4	16·6	5·9	3·44	60 0	17·4

THE USE OF ALCOHOL FOR LIGHTING.

In view of the interest attaching to the lectures recently delivered by Professor Lewes at the Petroleum Institute, and especially of the one reported in the "JOURNAL" last week, it may not be out of place to give a few particulars of the appliances now in use for utilizing alcohol for purposes of illumination, especially in view of the exhibition which is to be held in Paris from the 24th prox. to the 1st of June.

Lamps for burning alcohol are of two kinds: (1) Direct combustion, and (2) incandescent. In the former, the spirit is burnt freely with a wick and glass chimney, as in ordinary petroleum lamps; and, since pure alcohol does not give a luminous flame, it is mixed with a carburizer in the proportion of 40 to 60 per cent. —a special burner being substituted for the ordinary one. These lamps are portable and of variable power, and do not give out any disagreeable smell; but they are far inferior to the incandescent lamps in which alcohol is burnt in the gaseous state in contact with a Welsbach mantle. The last-named lamps give a better illuminating effect with a more agreeable light—never flaring, and being perfectly inodorous; while the fragility of the mantle does not prevent them being carried about, provided shock is avoided. The principle of all these lamps consists in vaporizing the alcohol, mixing the vapours produced with air in suitable proportions, and consuming the mixture in a burner of the bunsen type with a Welsbach mantle.

There are two classes of incandescent alcohol lamps—those with the reservoir above, and those in which the spirit rises in the wick by capillary attraction. In the former class, the alcohol reaches the burner, under pressure, through a tube lined with asbestos, being heated in the chimney surmounting the glass; and the consumption appears to be very low. This lamp, which has the disadvantages of not being portable and not being entirely free from danger, has been adopted by the Emperor of Germany, who is a great partisan of alcohol lighting, at the Palace of Potsdam, and it is also in use at several Berlin stations.

In the second class of incandescent lamps, the wick leads the alcohol to the vaporizing chamber, which is heated either by conduction or by a pilot-flame. In the "Phœbus" lamp, which is largely used in Germany, ignition is effected by a pilot-light, which receives the quantity of spirit necessary to heat the vaporizer; and when once the lamp is lighted, the pilot is extinguished—the heat given out by the mantle sufficing to vaporize the alcohol. These lamps, which may be bought for about 12s. each, cost about 1½d. per hour for a light of 9 candles. In the "Eclatante" lamp, the vaporizer can take an ordinary No. 1 or No. 2 Welsbach burner; and the vaporization is effected by a pilot-flame light constantly burning, which permits the regulation of

the flame from zero to its maximum as simply as with a gas-cock. This lamp only costs 5s., and does not involve any danger.

The French Minister of Agriculture is offering one gold, three silver-gilt, four silver, and six bronze medals for incandescent lamps burning pure debased alcohol suitable for lighting streets, stations, and works, and the same awards for similar lamps for domestic use, and also for incandescent lamps utilizing carburized alcohol both for streets, &c., and for domestic purposes. In addition to the above, one silver-gilt, three silver, and four bronze medals are offered for lighting appliances with the free flame utilizing carburized alcohol. Additional medals will also be placed at the Jury's disposal for distribution to those who show appliances not coming within the classes of the competition at the Exhibition above mentioned. The Jury are enjoined to take into account the quality of the light afforded, its durability, fixity, and intensity, the facility for lighting and extinction, the consumption of alcohol, and the construction of the appliance as regards safety and elegance.

IMPROVED PELOUZE AND AUDOUIN TAR-EXTRACTOR.

Herr Guldlin has recently devised an improved form of this well-known apparatus; and its manufacture has been taken up by a Vienna firm—Franz Manoschek, of Linzerstrasse, 160.

While several previous attempts to raise the capacity of the Pelouze and Audouin tar-extractors by a different construction of the bell have failed, Herr Guldlin, by his mode of construction, has succeeded in increasing considerably the capacity of the tar-extractors. The annexed figures show in section and elevation the apparatus as constructed by Herr Guldlin. It will be seen

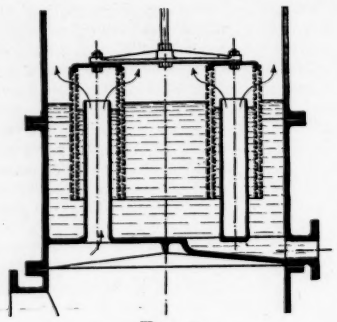


FIG. 1.

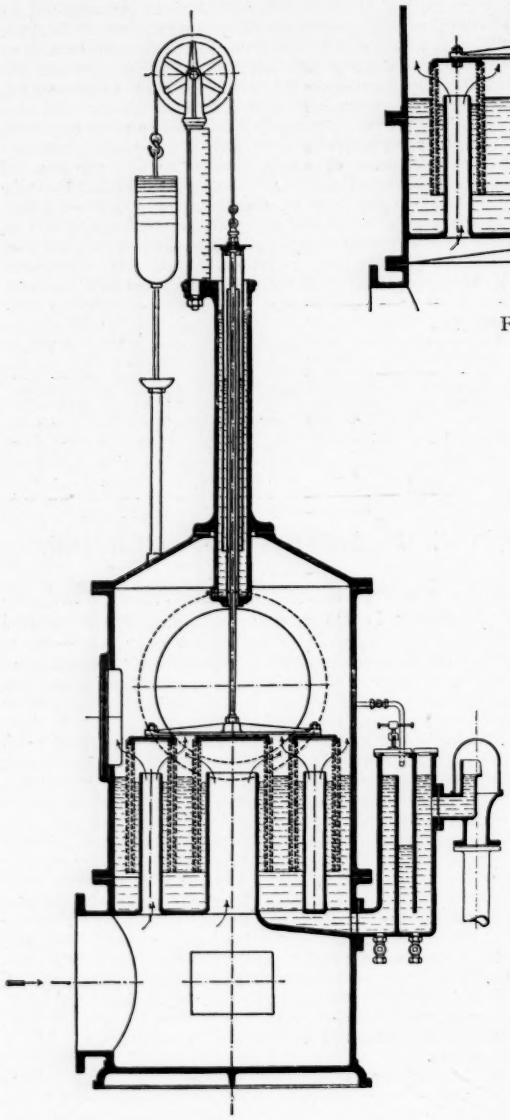


FIG. 2.

FIG. 3.

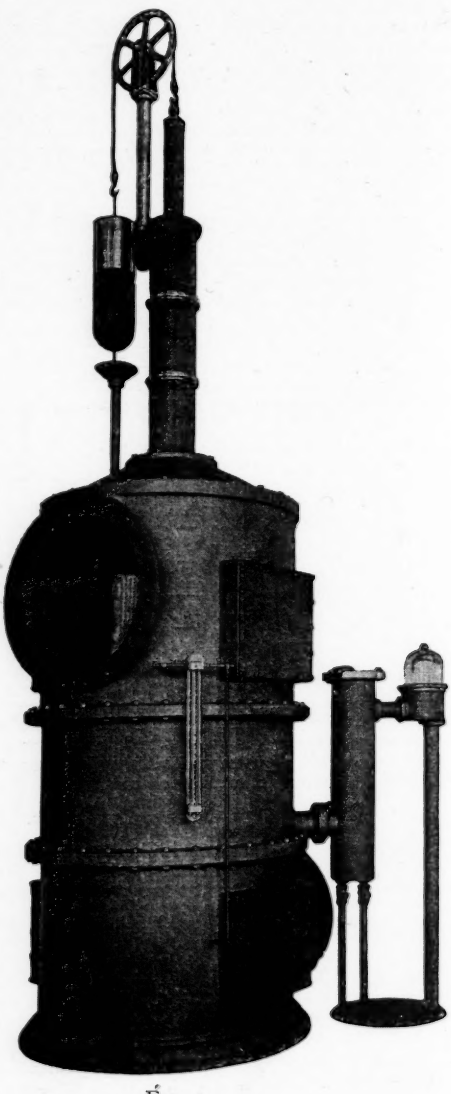


FIG. 4.

that, by the new construction, two or more bells of different diameter are set one within the other. By placing one bell within another, as shown in fig. 1, about one-and-a-half times the total capacity of the ordinary arrangement, with only a single bell, is secured; and by putting three bells one within the other (as in fig. 2), nearly double this capacity is obtained. Speaking broadly, the new apparatus is very similar to the original; but several improvements have been made with regard to installation and manufacture. Figs. 3 and 4—taken from photographs—show the relative sizes of Pelouze and Audouin tar-extractors, with bells on Guldlin's plan; fig. 3 having a daily capacity of 990,000 cubic feet, and fig. 4 of 4,943,000 cubic feet.

The following advantages are claimed for the Guldlin construction of the apparatus, as compared with the ordinary arrangement: 1. Considerably greater capacity for a given size. 2. In the case of a large production of gas, one Guldlin apparatus becomes nearly equivalent to two of ordinary construction. 3. Smaller outlay, as the apparatus can be reduced either in size or number, and a corresponding reduction in the connections and valves be thus effected.

At the annual meeting of the Iron and Steel Institute, to be held in London on May 7 and 8, Mr. J. Thiry will submit a paper "On the Recovery of Bye-Products in Coking."

The erection of gas-works near collieries and the compression of the gas for transmission in pipes to places of consumption, form the subject of a pamphlet by MM. T. Cambier and J. Bernard, who hold out the hope of being able in this manner to supply Paris with gas at one-third the present cost—viz., 10 c. per cubic metre (2s. 3d. per 1000 cubic feet)—and the Municipality at half that price.

THE COST OF HIGH-PRESSURE GAS-LIGHTING.

The "Mystery" of the Expense of Pressure Raising.

In the course of Professor Vivian B. Lewes's final lecture at the Petroleum Institute, published last week, he made this statement: "When you come to the high-pressure gas-burners, it is exceedingly hard to speak definitely. No one has ever got over the mystery of how much the pressure in these high-pressure systems really costs; and if these systems in any way approach the price claimed for them, you will get 1000 candles for 1¾d." Now we knew that with Mr. J. G. Newbigging, the Corporation Gas Engineer of Manchester, the cost of the pressure was not a "mystery," as he had carefully prepared a statement giving every detail of expense connected with their Welsbach high-pressure installation on the Infirmary Esplanade for twelve months. In view of Professor Lewes's statement, we asked Mr. Newbigging whether he would kindly furnish us with the details for publication. He cheerfully complied; and we have pleasure in presenting them here to Professor Lewes and our readers generally. They are as follows:—

Results of Twelve Months' Working of the Intensified Lighting, Piccadilly, Manchester.

FIRST COST.

	£	s.	d.
Cost of laying service-pipes and connections	86	6	8
Total cost of connections by the Water Department	2	1	5
Cost of Keith compressor, burners complete, and connections to compressor and gas and water meters	66	12	1
Casing, &c., for compressor	7	11	8
	£162	11	10

MAINTENANCE.

From March 15, 1901, to March 14, 1902 = 365 days.

	£	s.	d.
Gas consumed, 865,000 c. ft., at 2s. 9d. per 1000 c. ft.	£118	18	9
Water consumed, 227,500 gallons at 4·85d. per 1000 gallons	4	11	11
Hire of water-meter and repairs to same	0	16	0
497 mantles and 10 rods	24	17	7
Extra attendance, glazing, repairs to compressor, &c.	12	7	9
	£161	12	0
Interest on capital at the rate of 10 per cent. per annum	16	5	2
	£177	17	2

Total number of hours burning	3807
Total number of burners	35
Mantles renewed	497
Total cost for each hour's burning	11 21d.
Cost per 1000 candles per hour	1 64d.

NOTE.—The illuminating value of gas taken at 30 candles per cubic foot.

The James Keith and Blackman Company, Limited, writing on the same subject say:

We cannot understand Professor Lewes's remark as to the cost of the pressure in high-pressure gas systems being a "mystery." He certainly can never have experimented with our compressors. We have gone into the question based upon actual experience in over 500 installations of the cost of producing a light of 1000-candle power, and give herewith a table showing the cost. In the first case, we quote the cost using 33 feet of gas per hour to give an *actual* 1000 candles. It is usually reckoned that 1000 candles are obtained from a cluster of three burners, using 30 feet of gas; so we give the cost of the actual and reputed 1000 candles, to be perfectly fair.

Cost of 1000 *Candles Actual per Hour.*

33 cubic feet of gas at 2s. 6d. per 1000 cub. ft.	0·990d.
Water at 1s. per 1000 gallons	0·067
Mantles at 8d. each	0·100
Total	1·157d.

Cost of 1000 *Candles Reputed per Hour.*

30 cubic feet of gas at 2s. 6d. per 1000 cub. ft.	0 900d.
Water at 1s. per 1000 gallons	0·051
Mantles at 8d. each	0·100
Total	1·051d.

In making up this table, we have taken gas at 2s. 6d. per 1000 cubic feet (a very fair average), and water at 1s., and allowed just half the time we allow for mantles where we have to do the renewal work ourselves. As a matter of fact, in the big manufacturing districts, where our system is largely in use, the average for water would be 6d. per 1000 gallons, and gas lower than the price stated, which would bring down the cost considerably. As is well known, our compressor uses a very small amount of water; the average consumption with a comparatively low pressure being 1·7 gallons to compress 10 cubic feet of gas with a small machine. These are the results obtained by carefully testing four No. 3 compressors supplying 160 burners at the Leicester Gas-Works. With our large machines, the cost is much smaller.

At the Glasgow Exhibition our machines used 0·6 of a gallon to compress 10 cubic feet of gas. This works out at 0·01d. for 1000 candles per hour, as water is only 6d. per 1000 gallons there. It will thus be seen that, in actual practice, the cost of compressing gas is a mere bagatelle—in fact, so small that many water companies do not charge anything.

With regard to the amount of attendance required with our burners, it is so small that we cannot take it into reckoning; and the gas compressors need absolutely no attention.

MICHIGAN GAS ASSOCIATION.

Annual Meeting at Kalamazoo (Mich.).

The Ninth Annual Meeting was held on Feb. 19 and 20—the PRESIDENT (Mr. Paul Doty, of Detroit) in the chair.

THE PRESIDENT'S ADDRESS.

The first item was the delivery of the usual Inaugural Address; and the President commenced by remarking that the Association was now assembled at the place of the first meeting, and that a fitting opportunity was thus afforded for reviewing the work done by it. In this connection, he mentioned that one paper had been read on the construction of gas-works, one on management, five on manufacture, five on distribution, twelve on consumption, seven on relations to consumers, and four on other subjects. It was perhaps a national feature to give prominent attention to the business end; but the subject of management might with advantage receive a larger share. Out of a hundred members, no less than thirty had contributed to the proceedings—indicating active, real interest in the welfare of the Association, and making for a high standard of membership; and he appealed to the other seventy to stand in and take their share. The increased assessment valuation of gas properties throughout the State was a serious matter, as in some cases the taxes now amounted to 5d. per 1000 cubic feet, which was a staggering load to carry. The law provided that every parcel of property should be valued at its fair current market price, so far as it was possible to arrive at it; and he thought the Association might assist by laying down some equitable and logical method of arriving at the current value of any gas-works or undertaking. This might be done on the lines adopted by a prominent banking house in New York that invested largely in gas securities, and who, before purchase, investigated the value of all the property, and the soundness of title, the character of the purchase, and the earning capacity of the plant. The whole problem of taxation was worth attentive study; and he would welcome a paper on it. He thought the time was now ripe for a Michagan Gas Commission, on the lines of the Massachusetts Commission. These things had not been popular in the State; but the good work done by the State Tax Commissioners would pave the way for others. There was no question but that in Michagan they held to the opinion that local authorities should regulate not only the terms, but the rates of service. The Detroit Corporation were now attempting to fix the price of the gas sold by the local Gas Company at 2s. 11d. per 1000 cubic feet, and to prevent the sale of gas at differential prices. The Gas Company's Act, which was passed in 1893, fixed the maximum for lighting gas at 4s. 9½d. per 1000 cubic feet, subject to 7½d. discount for cash, and 3s. 9d. for fuel gas, subject to 5d. discount for cash. The Corporation contended it was wrong to have two prices, and to discriminate between those who had ready money and those who had not. He proceeded to argue in favour of a uniform rate. If public corporations were to be worked on strictly equitable lines, bnsiness expedients—such as a lower price if used for fuel, cash rebates, &c.—must give way. The benevolent promoter of opposition companies, like the poor, was always with them; and the best way to encounter him was by means of hard facts. If he promised half-crown gas, prepare a table showing the earnings (if any) on gas at that price in the particular district. There was a desire to regulate the affairs of public companies; and the best way to meet it was by publishing full and fair statements of accounts. Some attention was being given to a uniform system of accounts for gas companies by kindred Associations; and Michagan should co-operate if need be. He was glad to notice increased interest in educational work, as evidenced by the correspondence school of the American Association and the gas literature index of the Western Association. As to themselves, they were successfully supporting a scholarship in gas engineering. Looking at the increasing demand for educated men in their business, he proposed that this year's contribution from the Association funds should be £20, and that renewed efforts be made to obtain subscriptions from gas companies. Profit-sharing with the employees had been started at Grand Rapids; the wages paid being regarded in the light of a sum invested. £100 a year wages were credited with interest, just the same as £100 cash of investment. The Grand Rapids Gas Company were also foremost as regards comforts for the employees, providing lavatories, baths, lockers, and recreation rooms, an annual entertainment, old-age pensions, and other refinements. As regards advance of business, he believed the sales of gas in Michigan for 1901 would be 30 per cent. more than those for 1900. A 2½ million cubic feet water-gas plant had been erected at Detroit, and a battery of 30 Semet-Solvay coke-ovens at Delray. High-pressure distribution was being successfully applied in the outlying parts of Detroit. No natural gas was now being exported to Detroit; and the failure of the Canadian supply was a severe blow to local industry.

Mr. A. M. Freeman, Chairman of the State Tax Commission, addressed the meeting, and described the methods followed by his Commission in arriving at the assessment of gas properties. The report of the Executive Committee, which included the recommendation for election of twelve active and two associate members, was adopted.

THE BUILDING OF A WATER-GAS PLANT.

Mr. C. W. Tippy, of Detroit (Mich.), read a paper on the above subject. The supply of gas by the Detroit City Company

had reached the maximum capacity of their two gas-works—having increased 30 per cent. in a year; and on days of heavy consumption, they relied upon the assistance afforded by natural gas. But it became evident that the supply of natural gas was nearly exhausted, and would not be available next winter. After due consideration, it was decided to erect an 8 ft. 6 in. Western Gas Construction Company's water-gas set, of a capacity of 800,000 cubic feet per diem, at Station "A," as an addition to two United Gas Improvement Company's machines already in operation, and a 10 feet set, of a capacity of 1¼ million cubic feet per diem, with purifiers, engines, boilers, &c., at Station "B." The present 300,000 cubic feet holder at Station "B" was utilized as a relief holder, and a new million feet holder erected. There is a district holder at a site between the two works; and a No. 8 Roots exhauster, with reversing gear attachment, was erected at the site, to supply gas to or from Station "A" or "B," as might be required during the alterations. Two 75-horse power boilers at Station "B" were replaced by three 125-horse power boilers. The various contracts were placed early in 1901, under heavy time forfeits. The ground for the new holder was first broken on April 20, and proved to be a firm, hard blue clay. On this a concrete foundation, 12 inches thick and 18 inches thick for a width of 3 feet at the circumference, was laid down. It consisted of one part Wabash portland cement, 3 parts clean sharp sand, and 6 parts clean limestone, broken to pass a 2-inch ring. The bottom and first side sheets were put together upon 30-inch uprights, a layer of cement and sand laid, and the finished bottom lowered into place, working from the centre outwards—the circumference being supported by jacks, and gradually let down. Several illustrations showing the progress of the construction of the holder were exhibited. The tank required 2¾ million gallons of water, and was filled in 63 hours from the city supply. The generator house at Station "B" was designed to accommodate two 10 feet sets, and was 63 ft. by 43 ft. by 30 ft. high, with walls 16 inches thick, and charging floor 16 feet above the ground level. The apparatus comprised a 10 ft. by 15 ft. generator, with combination up-and-down valve connections and hollow bearing bar grates for the divided blast, one 9 ft. 6 in. by 20 ft. carburettor, with special vaporizing chamber having six oil injectors built into the lining, and an annular passage for distributing the air blast. The dimensions of the superheater were 9 ft. by 27 ft., fitted with an 18-inch slack valve. An 18-inch pipe led from the superheater to the seal-box on the charging floor, which was 6 ft. 6 in. by 4 ft.; and from this a 16-inch pipe was carried to the scrubber, which was 7 ft. diameter by 24 ft. 6 in. high, packed with 6-inch boards spaced 2 inches apart. The condensor was 7 ft. 6 in. diameter by 24 ft. 6 in. high, and contained 220 3-inch tubes. The oil was heated by exhaust steam, and fed to the machines by an improved automatic supply system. The generator, carburettor, and superheater were laid on 5-inch I beams, so as to get a free circulation under them, and the blast was furnished by a No. 9 Sturtevant blower driven by an Atlas engine. The boiler chimney was 130 ft. high and 5 ft. diameter, lined with fire brick for the first 25 ft., and also the top 10 ft. The engine-room contained two No. 8 direct connected Roots exhausters, two No. 9 Sturtevant blowers driven by Atlas engines, two steam oil-heater and pressure pumps, and the works water-supply pumps. The purifying house was 117 ft. by 30 ft. by 30 ft. high, and contained a Chollar washer, and four purifier boxes, each 20 ft. square, and 11 ft. 6 in. deep, with 16-inch connections. The boxes are charged by means of elevators, and emptied through doors in the bottom. The purifying house also contains a 100,000 Wiley's proportional meter. This was found to deal satisfactorily with 175,000 cubic feet per hour. The tar-separator was made of white pine, 7 ft. by 12 ft. by 8 ft. deep. There are two storage tanks for oil, each of 100,000 gallons capacity. In August, the natural gas was shut off; and the increased sales rendered it necessary to at once place the order for the second set. Several temporary expedients, including the use of a locomotive as a temporary boiler, had to be resorted to; and the manufacture of gas from the new sets was commenced on Oct. 4. Although the whole of the details were not yet completed, he had managed to tide through the winter. He had successfully purified over 2 million cubic feet per diem with two of the 20 ft. boxes.

The next item was the paper on the "Theory of the Incandescent Mantle," which has appeared in the "JOURNAL" (p. 892).

Mr. E. D. Campbell, of the Michigan University, delivered a lecture on the function of original research in technical education. Several other items followed, including the consideration of the contents of the "Question Box," after which the meeting was adjourned.

Lighting at the Lille Exhibition.—It is announced that the gardens of the Lille International Exhibition, extending over 179,405 square yards, are to be lighted by Lucas incandescent gas-lamps. The Exhibition, which is to open on Thursday, and close on the 15th of September (unless prolonged), contains two classes that interest our readers—viz., Group V., Electricity, including Electro-Chemistry and Electric Lighting; and Group XVIII., Debased Alcohol and its Various Applications to Industry, including Light, Power, and Heating. M. Delebecque, General Manager at Lille of the Imperial Continental Gas Association, is a member of the Honorary Committee of the Exhibition, which is under the patronage of the Lille Municipality.

FILTRATION OF RIVER WATER.

By ALFRED J. JENKINS, Assoc.M.Inst.C.E., of Burton-on-Trent.

[Extracts from a Paper read before the Association of Municipal and County Engineers at Birmingham.]

The purity of our water supplies is a subject which naturally attracts the attention of all who are associated with municipal government; and as the responsibility of preserving it falls upon the engineer in charge, it is a subject well worthy of consideration by this Association, which embraces so many who are engaged in the design and management of water undertakings. Since the passing of the Rivers Pollution Prevention Act of 1875, very much has been done, more especially in the last few years, to mitigate the horrible pollution that has been poured into nearly all our finest rivers; but much still remains to be done, and municipal engineers, more than any others, appreciate the hopelessness of ever being able to keep all pollution from rivers, which flow through, and therefore drain, our more populous districts. The question then arises as to whether rivers, which are liable to pollution, can be regarded as possible sources of water supply, and, if so, what means are necessary to prevent such a supply becoming dangerous to the health of the community.

In considering the question of the purification of a particular river water, the engineer has not to use stereotyped rules in dealing with every case in a similar manner; but he has to consider the degree of impurity of the water in question and the uses to which it has to be put, together also with the practicable means available, and the expenditure which is permissible. It is a matter of regret that the latter point is one of some considerable importance; and it is unfortunate that the question of water supply has only recently begun to be recognized as one of national importance, and that unreasonable cost is often thrown upon poor authorities whose geographical position places them in very great difficulty.

The consideration of the purity of water is one of extreme complexity, and it is not satisfactory to say that because a water contains less than a certain standard of chlorine, ammonia, nitrates, and so on, that it is fit for domestic consumption; neither is it possible to condemn a water because it contains certain of these matters in excess. The whole history of the water must, if possible, be traced out, and, in conjunction with the chemist, the geologist and the bacteriologist must be consulted. The universally accepted bacteriological standard of purity is 100 bacteria per cubic centimetre, which means that if a cubic centimetre of water be cultivated, it should produce not more that 100 colonies which can be counted.

When we begin to talk of hundreds and even thousands of bacteria per cubic centimetre (which only weighs 15½ grains), we are getting into very alarming figures. But it must not be thought that all these bacteria are pathogenic or harmful—indeed, by far the larger proportion are non-pathogenic. Nor must it be understood, because a bacteriologist examines a water and finds no pathogenic bacteria in it, that this particular water is fit for drinking purposes. We believe, however, that if a water is liable to organic pollution, and contains a large number of bacteria, some of them will be pathogenic, and that if we reduce the total number of bacteria, as we can do, by some 98 per cent. or thereabouts, we can also reduce the number of pathogenic bacteria in about the same proportion.

Having said so much as to the standards of purity, it will now be well to consider the means to be adopted for the treatment of raw water, and to put it into such a condition that the accepted standard may be maintained. The means taken to reduce the number of bacteria present will, with one exception, which will be hereinafter referred to, be the best means possible for the elimination of the mineral matter and vegetable and insect life present. In the treatment of river waters, there are three methods: (1) Sedimentation in storage reservoirs; (2) slow filtration through sand, with which we are most familiar in England; and (3) coagulation by the addition of chemicals, and the subsequent rapid filtration, which is largely adopted in the United States of America. The first of these is frequently used in conjunction with either of the others.

The advantages of sedimentation cannot be too highly advocated. A few days' rest will effect the clarification of river waters containing all but the finest of particles, and the deposit of mineral matter in suspension is accompanied by a very great reduction of the bacteria present. Apart from this, there is no doubt a great reduction in the number and vitality of the harmful bacteria by the bactericidal action of the harmless species working with the assistance of sunlight and air; and it may safely be assumed that the longer the period allowed for sedimentation, the greater the degree of purity that will result. It is not usual, however, to pay much attention to the bacteriological side of the question at this stage of the purification, but rather to consider the question of the storage necessary for the reduction of turbidity and the maintenance of a continous supply.

The amount of storage necessary to clarify any particular water can only be determined by experiment—it being wholly dependent upon the nature of the matter in suspension; but it is generally conceded that the longer the period allowed for sedimentation the better. The deposit of the coarser materials will, of course, greatly facilitate the subsequent filtration, if only regarded from a

mechanical point of view; and it will, moreover, immensely reduce the cost of cleaning filters.

Filtration is merely the straining of water through fine insoluble media, and nothing is, of course, more suitable than clean fine sand. The flow of water being continuous, the filter first becomes clogged in its upper layers by the coarser particles present in the water, which are larger than the interstices between the sand grains. This, of course, reduces considerably the size of these interstices, and consequently the finer particles present in the water are intercepted. This process goes on until the bacteria are also intercepted in ever-increasing numbers, until the time arrives when the filter becomes blocked, and scraping off the top layer has to be resorted to.

As the result of careful observation, it has been found that if a high degree of baterial efficiency is to be maintained, the rate of filtration must not exceed 4 lineal inches per hour, which is practically 2 gallons per square foot per hour, or rather more than a million gallons per acre per 24 hours. It is highly essential that this rate of filtration should be regular, and controlled in such a manner that it cannot possibly be exceeded, or the effect will be to wash the bacteria previously caught on the upper layers of the sand into the coarser materials below, or through the filter altogether. It must also be noted that, in starting or re-starting a filter after cleansing, a much lower rate of filtration should be used. It is hardly necessary to go into the question of construction of the walls and floor required, or to point out the necessity of their being of substantial design and good workmanship, thoroughly water-tight in every part; but the depth necessary is of importance. From 7 feet to 8 ft. 6 in. deep is usually regarded as correct; but the writer prefers the greater depth, divided as follows: Bottom gravel ($\frac{3}{4}$ to 2 in.) 6 inches; three 4-inch layers of $\frac{3}{4}$ in. to $\frac{1}{8}$ in. gravel, 12 inches; fine sand, 3 feet; water above sand, 2 feet; space above water 2 feet. The size of the sand grains has been a matter of much contention. It is of importance that they should be uniform in size, and as fine as can be obtained. The author has used sand so fine that over 60 per cent. of the particles would pass through a sieve of 4900 meshes to the square inch, and the filters are giving excellent results. It was considered necessary to put under this fine sand a 6-inch layer of rather coarser sand, to prevent it being washed away. There is no doubt that, with 4 or 5 feet of sand of a grain $\frac{1}{100}$th to $\frac{1}{80}$th of an inch diameter, after the sand has been used for some time a rate of filtration of 4 gallons per square foot per hour may be used; but such fine sand is not always obtainable, so that it is advisable to keep to the slower rate of working.

With a depth of sand of 3 feet only, scraping for the purpose of cleaning, which reduces the thickness by about $\frac{1}{2}$ inch on each occasion, should not be continued for more than a foot in depth. Two feet of sand must be the minimum remaining; and if the source is a polluted one, a greater depth is preferable, because at times the surface of the sand becomes broken, and it is only by a great depth of sand that bad filtration can be avoided. The greater the depth of sand, the more the support for the surface layer of slime, which is the most useful part of a filter-bed.

It is pretty generally known that a filter composed of entirely new and sterile sand is, when started to work for the first time, a very dismal failure. Even if the sand has been most carefully washed before being placed in the bed, the first result is that the water leaves the filter of a worse appearance than when it entered it. After a few days (sometimes as few as seven), a decided improvement becomes apparent; and with average water, three weeks produces a perfect effluent at maximum speed.

It is not sufficient that the outlet from a filter-bed should be merely controlled by a sluice-valve. Under such conditions, it is absolutely impossible to ascertain what the head on the filter is, or whether the safe head is being exceeded. The outlet and gauge wells should each be provided with wash-out pipes for the purpose of draining them, and an inlet pipe for charging the filter with filtered water from an adjoining bed.

In cleaning a filter, it is not necessary to take out any large quantity of sand—in fact, the object should be to remove as little as practicable. The operation is usually performed by carefully skimming off $\frac{1}{2}$ inch by means of shovels, and removing it to a convenient depôt. On re-starting the filter, there is an absence of efficiency, due to the comparative coarseness of the top layer; and filtration should be conducted slowly. With some river waters, it may be possible to use the water after 24 hours; but seldom should the normal speed be reached before the filter has been in use for three or four days.

The washing of sand presents very considerable difficulty, and is a question which frequently troubles the engineer. There are several types of machines in use, including small boxes in which from half-a-cubic yard to a yard of sand is washed by the upward flow of water. These are not altogether satisfactory, owing to the immense amount of labour entailed in emptying them. A more mechanical method is based on the principle of a revolving horizontal cylinder, along which the sand is forced in one direction with a current of water introduced to flow in the opposite direction, and the speed so adjusted that the sand leaves the cylinder quite clean. It is sometimes advisable to wash sand immediately it is removed from the filter, otherwise vegetable spores germinate and grow. It is sometimes found, where such are absent, that sand washes better if allowed to stand for a month or two exposed to the cleansing action of the sun and air. The sand removed at each cleansing, even when immediately washed, is not then replaced, but the scraping is continued until the permitted minimum depth of sand is reached, after which the filter is restored to its original form.

So much depends upon local conditions, that no definite sum can be put down for the cost of construction of filtration works; and working expenses are also so dependent upon the condition of the raw water to be treated, that they are far from uniform. It may, however, be interesting to state that the average cost of a large number of works, scattered over the whole of Northern Europe, has been about £10,000 for uncovered, and £15,000 for covered filters; and at these figures first-class work can be carried out in England at the present time. In the United States, the average cost has been $30,000 per acre for uncovered filters, and about half as much again for covered ones. These figures are exclusive of reservoirs and sedimentation basins. The average cost of working the filters of the London Water Companies for fifteen years has been stated by Mr. W. B. Bryan, the Engineer of the East London Company, to be slightly over 4s. per million gallons; the minimum being 3s. for the Chelsea Company, and the maximum 4s. 9d. for the Grand Junction and West Middlesex Companies. In Germany, where more turbid water has to be dealt with, the cost is higher. This, of course, includes all labour, sand-washing, and supplies for the filters.

Reference has already been made to the use of sedimentation tanks or reservoirs preparatory to filtration. Any attempt to pass turbid waters through sand filters without some preliminary treatment results in the very rapid clogging of the filter; or if the silt be a very fine one, turbidity will still remain. The conditions which prevent the passage of the fine suspended particles through sand filters are similar, in a general way, to those which control the removal of bacteria. But it is perfectly possible to filter a certain water with excellent bacterial result, and to still have a turbid effluent, because some rivers contain mineral particles which are smaller than bacteria; and, moreover, bacteria probably have the power of adhering to the sand grains much in excess of that possessed by the clay particles. On the other hand, it does not necessarily follow that because a filter can reduce the turbidity of a water, it is effectively reducing the bacteria.

The American method of dealing with turbidity (which by the bye is much in use in Europe also) consists of the addition to the raw water of a precipitant, or, as it is generally known over there, a coagulent—such as lime or sulphate of alumina—which forms an inorganic precipitate in the water, the presence of which causes an aggregation of the fine particles in suspension to take place. These, by their combined weight, more readily find their way to the bottom of the tank or pond, in which the water must be allowed to stand for some time, unless, indeed, the action be permitted to take place in a filter, when the current of water quickly carries the precipitate to the sand, where it is arrested.

The coagulent in most general use is alum. This salt forms a gelatinous precipitate, which quickly aggregates the fine suspended particles present in the water, including the bacteria, and allows them to be more easily removed by filtration than would otherwise be the case. In addition, the alumina has a chemical affinity for dissolved organic matter, and the chemical purification may be more complete at very high rates than would be possible with sand filtration with coagulation at any rate, however low. Waters stained yellow or brown by contact with peat, which cannot be in the least degree altered in colour by sand filtration alone, can be effectively dealt with by the coagulation method. Lime may be used with advantage as the coagulent in certain cases, where it may also serve a second purpose, such as in the softening process sometimes required, or for the neutralization of acid water, which is capable of taking up lead from service-pipes.

The amount of coagulent to be used must in each case be carefully studied. An insufficient quantity will be no good, an excess would be useless waste of money, and, in the case of alum, would be dangerous to the purity of the water. This last-named point is one of the chief arguments of the enemies of the system; and undoubtedly it is an objection. But there is a big margin of safety; and in all cases of purification of water for domestic consumption, supervision must be so complete that carelessness in working is quite eliminated.

The term "mechanical filters" has been applied to filters of a particular class which deal with water at a much greater rate than the slow sand filters already described—in fact, something like 50 to 100 times the quantity of water per unit of surface area is passed through a mechanical filter as through the other type. As already stated, sand filters are mechanical in their methods of operation; but when the term is applied to filters, it is meant to indicate that a distinct type is referred to which requires a great amount of manipulation and attention.

This class of filter has been very extensively used in the United States; and the reasons for its adoption include small first cost, and efficiency in dealing with muddy waters. The causes which have probably prevented their general adoption in England are the heavy working cost, the success of the older methods, and our insular prejudice to innovations. Comparing the two systems, and considering working cost against first cost, there is practically no difference between them. Furthermore, it has been shown that as high a bacterial efficiency can be obtained with the newer method as with the older. But there is no doubt that it requires constant supervision in the highest degree; the risks of accidental interference are infinitely greater; and therefore the risks to health are much increased.

The construction of a mechanical filter is usually as follows: A cylindrical vessel, probably of iron, partially filled with sand of

uniform grain, and considerably coarser than that in use in slow filters. This sand rests upon a perforated plate; and provision is made that it will not be washed away. The rate of filtration being so greatly in excess of 4 inches per hour, this filter would of itself be useless to prevent the passage of bacteria; so that it is almost invariably used in conjunction with the coagulation method already described.

The alumina compound—a sulphate—reacts with the carbonates of lime and magnesia contained in the water (if these are absent in the raw water, carbonates must be added as a preliminary to the treatment), and is precipitated as alumina hydro-oxide—a magma of gelatinous appearance and quite insoluble in water. This material, falling to the bottom of the water, mechanically entangles all suspended matter and bacteria, and is deposited in a layer upon the surface of the sand filter, so producing in a few minutes the real filtering medium, which in the slow sand filter is only produced after many days. Until the deposit is sufficiently great to give bacterial efficiency, the filtrate must be wasted. After a comparatively short time, varying, as in the sand filter, with the turbidity of the water, the deposit becomes so great that its removal is necessary. This is done by introducing a reverse current of filtered water—the sand meanwhile being stirred up with rakes. This washing can be accomplished in about 15 minutes, and at an expenditure of filtered water which need not exceed 5 per cent. of the quantity passed through the filter since the previous washing; but with very muddy waters more is required, and in an exceptional case at Louisville the amount sometimes reaches 30 per cent.

Apart from the quick formation of an artificial "bacterial felt," a further action of the precipitated alumina hydro-oxide is to unite with the dissolved colouring matters of tinged or stained waters, removing them, and producing a clear and sparkling product, which cannot be arrived at by the English system. It has been demonstrated that high bacterial efficiency can be obtained with this class of filter, even in the absence of turbidity; but it is dependent principally upon the amount of sulphate of alumina used. In very large plants, it has not been usual to have very large individual filters, but rather to have a large number of them—a battery of 20 or more being by no means an exceptional size. There is little chance of working such plants without frequent accidents, which must be a great objection to the adoption of mechanical filters with waters liable to serious pollution, and required for domestic consumption.

The Puech system of filtration, which is a modification of the slow sand method, has recently met with much favourable comment. The idea is to introduce a preliminary roughing filter, by means of which the coarser materials in suspension are intercepted, with the result that the slow sand filters do not require scraping so frequently; thereby saving a great amount of labour, and the time otherwise lost in ripening the beds. This system is in use in Paris and elsewhere; and it is stated that the slow filters will run three or four times longer without scraping. The Grand Junction Water Company have used double filtration with much success—two separate systems of filters at different levels being provided. At Bremen and Altona, the filters are all on the same level; but the water (in each case a highly polluted one) is passed first through a recently cleaned bed, thereby supplying it quickly with the ripening materials, and then through a ripe bed, which is certain to give high bacterial efficiency. In both towns the results obtained are exceptionally good. Other systems of filtration include the Fischer and Maignen; but it is difficult to see that the excessive cost results in any considerable efficiency.

The author has attempted to describe methods adaptable to the purification of very polluted waters. It does not follow that because a bacterial efficiency of over 98 per cent. is necessary with water from the Elbe or the Scheldt, that it is required with that from the upper reaches of such rivers as the Severn or the Dee. In such cases as these, filtration is a very different matter, and probably only means the straining out of the fish, and the insect and vegetable life. But between such extreme cases as those referred to there exists probably almost every grade of water, and each must be dealt with upon its own merits—always having regard to the importance of being on the safe side. The purification of polluted water is accomplished in four ways: By (1) dilution; (2) time; (3) sedimentation; and (4) filtration. When the first two fail or are not available, the third may be employed; but the surest and safest method we know is filtration.

Discussion.

Mr. C. J. Silcock (Leeds), in opening the discussion, said, with regard to the sand used in the filters, he was disposed to think Mr. Jenkins was asking for too great a degree of fineness, when he spoke of 60 per cent. of the particles passing through a sieve of 4900 meshes to the square inch. What was more to be aimed at was the degree of uniformity than of fineness. With regard to the depth of sand, he thought 3 feet should certainly be the maximum. He did not think there was any special point in having too great a depth of sand. The principal thing was to have good sand, and not to filter at too great a speed. With respect to the discoloration from peat, in the case of water obtained from certain gathering-grounds, especially in Yorkshire, discoloration from peat was very marked, and was difficult to get rid of. They could not filter it out, and the greater part of it must be taken away by sedimentation in the reservoir. He noticed, when flood waters came down, which brought a lot of clay and discoloured water, that this clay took the peat out of the water in the reservoir. A great many people overlooked the good effect produced by sedimentation. To his mind, it was equal to filtration. In the case of catchwater reservoirs, they obtained an advantage which they could not get from water from the rivers.

Mr. J. Parker (Hereford) said they had to filter the water in his city because it came down to them in all sorts of conditions. One day it was bright, sparkling, and pellucid; the next, it was flood water, containing 200 bacteria to the centimetre; and the following day they could multiply the bacteria by 20. Sand filtration did much to arrest them, and to make the water more reliable for drinking purposes. At Hereford the storage capacity was much limited, as was also the filtration area; so that it became a question of allowing the water to be used—water which was not of the very best quality. They had, however, some difficulty in getting the Local Government Board to sanction a loan for mechanical filters.

Mr. T. Caink (Worcester) said he noticed that Mr. Jenkins said the whole history of the water should, if possible, be traced out, in conjunction with the chemist, the geologist, and the bacteriologist. Mr. Jenkins had omitted from the list the professional man who should be consulted first of all—the Medical Officer of Health. It was becoming more and more manifest that the tests of the purity of a public water supply were the health statistics of the town consuming the water. The chemist might tell them the quantity of albuminoid ammonia, and the bacteriologist the number of bacteria, in the water; but, after all, the test of a water was the health statistics of the inhabitants of the town consuming it, and particularly the figures relating to water-borne diseases, such as typhoid fever and cholera. It had been shown that water subjected to sand filtration gave the best health statistics yet experienced. He had been interested in tracing the statistics of a number of towns supplied with different water; and almost entirely those which had river water—some of them polluted water—which was subjected to sufficient filtration, showed a lower typhoid rate than most of the places served with water which had the reputation of being extremely free from pollution. A number of the towns having water from the new red sandstone, which had the reputation of being of the highest quality chemically and bacteriologically, had a typhoid rate ranging from 150 to 200 per 100,000 of the population per annum. Towns supplied with river water, which received sewage pollution, had, when efficiently treated in an adequate filtering area, even without sedimentation, typhoid case rates ranging from only 20 to 50 per 100,000 of the population.

Mr. J. S. Pickering (Nuneaton), referring to the total depth of gravel in the filter, said Mr. Jenkins suggested that 18 inches, varying from 2 in. to $\frac{1}{8}$ in. should be placed on the bottom of the filter. He was inclined to agree that this was all that was necessary; yet when they visited modern works, they often found that double this depth of material was used. He would instance the Birmingham filters. Over the whole vast area of those beds there was a depth of 2 ft. 6 in. of gravel. To his mind, the beds would have been just as efficient with a depth of 18 inches. If this was so, it meant that a foot of excavation could have been saved, together with a foot of gravel over the whole area. Of course, there might have been some special reasons for having this particular depth. Instead of simply underdraining the filter, he thought the better course was to make an artificial floor, because in constructing these beds it was found almost impossible to keep the underdrains, which were simply loose agricultural tiles, in proper lines. He would have liked to have an opinion on the merits of the mechanical as compared with the sand filter. In America, he believed, the former was almost universally adopted; but he thought the reason was that the water they had to deal with was very different from ours. It seemed to be said by the bulk of American engineers that it was impossible to purify a turbid water through sand. Personally, he did not think a mechanical filter would be popular in this country, because the same conditions had not to be observed here as in America.

Mr. Watson (Engineer to the Birmingham Drainage Board) said it might be questionable whether the quantity of sand stated by the author was altogether right in the light of modern science; but, so far as its quality and size were concerned, there could not be the slightest doubt that a fine sand conduced to efficient filtration rather than otherwise. With regard to peat, he had found that if peaty water was exposed to sunlight for a considerable time it lost a good deal of its colour. Of course, if they had to expose the water to sunlight to take out the colour, it would be rather costly. If it was to be done at all, he thought the method recommended by Mr. Jenkins—the use of lime—was the best way of doing it.

Mr. J. Price (Birmingham) said, with regard to filtration through sand where there was clay in the water, he thought they would find it was a question of specific gravity and the size of the particular atoms they had to deal with. In clay, the atom was very small, and the cohesion was greater than with sand. If they took a sand with 10 or 15 per cent. of clay in it, and shook it up, with a little care they would get the whole of that clay on the surface, which would be almost impervious. If they had clay in the filtering material, they would find it would almost stop the filter.

Mr. Jenkins, in reply, referring to the depth of sand he recommended, said he certainly thought for a highly polluted supply—and his paper was an attempt to deal with such a supply—this should be the minimum thickness, as it allowed scraping to go on from the surface until the sand was 2 feet thick. If they were able

to use the filters in such a way that scraping could be done often—that was to say, if they had an opportunity of frequently putting back the sand—they did not require to go down so deep as a foot. All they wanted to do with the gravel was to prevent the smaller particles washing down. As to the fineness, he could only say that the finer they had the sand the more quickly they could filter with the same degree of purity. On the question of discoloration from peat, he could speak with some experience. At Cardiff, they had a daily supply of 5½ million gallons of water, and a storage of 100 million gallons. The water was stored for a considerable time, and when delivered in the town it showed a perceptible yellow tint, with the aid of the tintometer. It was also very apparent at the ice-works, where every block had to have about 2 inches sawn off at the bottom, as it was quite yellow, and full of peaty fibres. As to the underdraining, he thought the way Mr. Pickering had suggested was the best. If they used drain-pipes, they should be laid close together—almost like an artificial floor. The great thing was to have a perfect distribution of the water. Mechanical filters had been used in America chiefly because of the large quantity of water they had to deal with. The consumption was five or six times as great as in English towns; and if they used sand filters, they would require hundreds of acres. The mechanical filters would do much more than sand filters in the way of taking out the fine silt from the waters of the Mississippi and Missouri.

REGISTER OF PATENTS.

Incandescent Mantles.—Clamond, C., of Paris. No. 4229; Feb. 27, 1901.

The object of this invention is declared by the patentee to be "to remedy, as far as possible, the defects to which the refractory mantles used in incandescent gas lighting are liable—namely, fragility and lack of cohesion, too great flexibility when incandescent, shrinking from continued burning, and progressive loss of oxide of cerium or other excitant used in the manufacture of the mantle."

The inventor proposes to remedy these defects by replacing pure oxide of thorium by a mixture of oxide of thorium and oxide of zinc, which (from its behaviour in the flame) he believes to be a chemical compound of those two bodies. The oxide of zinc is quite unfit for the manufacture of mantles by itself; but when used with oxide of thorium in the manner described, it gives a firm, resistant mantle much less fragile when cold, and much less liable to deformation by too great flexibility when in use, than even the mantles now made. For practical purposes, it is necessary to add a small proportion of an excitant substance—preferably oxide of cerium; and this gives a mantle which is "at least equal in brilliance to the best thorium and cerium mantles, and which differs from them in the extraordinary degree to which it preserves its brilliance in use." In his experiments, he burnt a mantle of this construction for 900 hours without the light falling below the initial brilliancy. The mode of manufacturing the mantles down to the point of first exposing them to the flame does not differ from that of the mantles now in use, except that a mixture of nitrate or other soluble salt of thorium and nitrate or other salt of zinc is used instead of the soluble salt of thorium alone. The best proportions correspond to the ratio given by calculation from the molecular weights—that is to say, the oxides of the two substances in the finished mantle must be in the proportion of 3·28 to 1. Though this is the best proportion, it is by no means necessary to adhere to it in order to obtain to a certain degree the advantages which the invention offers. Even a mixture of 10 per cent. of oxide of zinc with 90 per cent. of oxide of thorium will "greatly improve the mantle." If the quantity of oxide of zinc used is too large, the mantle has a tendency to become brittle, and to split in the process of seasoning.

The employment of nitrate of zinc brings with it (the patentee remarks) a difficulty not present when oxide of thorium alone is used. Oxide of zinc is capable of being reduced in the flame to the metallic state, and then it volatilizes, and is lost. This is easily seen if a mantle dipped in a solution of nitrate of zinc, dried, and burnt off, is placed so that part of it is in the reducing zone of a gas-flame. Fumes will be seen to rise, which are produced by the volatilized zinc being reconverted into oxide in the air. But M. Clamond says he has discovered that, by properly seasoning the mantle, when a mixture of oxide of thorium and oxide of zinc is used, a substance is produced which is not liable to reduction in any part of the flame, and which gives a mantle possessing the qualities mentioned above.

In order to explain his process, he assumes that the ordinary mode of manufacturing mantles is adopted—that is to say, that they are made by dipping a fabric into a solution of soluble salts of the two substances (as this is the simplest for the purposes of description), though the invention is equally applicable to other modes of manufacture. The mantle is dipped and dried, and burnt off in the usual way. It is then exposed to the action of the oxidizing part of the burning-off flame, and when, in this flame, the elements have become thoroughly combined, it is exposed to a strong flame to give it its definite shape. The oxide of zinc is, by this process, fixed with the oxide of thorium, and is no longer liable to be driven off by the flame, while the mantle assumes its final shape.

As this process is said to be so important, he describes the way he usually performs it. In the first place, a large bunsen flame (preferably one with a green inside cone) is so placed that the cone is just below, but not inside, the mantle. The mantle is thus only acted upon by the ozidizing part of the flame. The transformation begins at the bottom of the mantle, and, rising slowly, reaches at last its top. This progress is marked by the substance of the mantle, which was at first opaque and non-illuminating, becoming gradually shining and incandescent. When the lower part of the mantle is thoroughly transformed, he gradually introduces the green cone partially into the mantle without injury to it, inasmuch as the lower part of it has then passed into its stable condition. When the combination of the elements is complete, the mantle is placed on a strong seasoning flame, which gives to it its definite shape; and when it has been so prepared, its elements are so firmly united together that the reducing flame has no injurious effect upon it.

The above description mentions a mixture of oxide of thorium and oxide of zinc alone. But such a mantle—though excellent in its physical qualities—would not give the requisite light; and therefore it is necessary to add, in the usual way, a small proportion of excitant, such as oxide of cerium. This is preferably added in the shape of a soluble salt to the solution in which the fabric is dipped. But M. Clamond has found that there is a considerable range in the proportion of cerium needed, or capable of being used. When the proportions of oxide of thorium and oxide of zinc mentioned above are employed, the best results are obtained from using about 0·4 per cent. of oxide of cerium; but a larger proportion can be used, up to even 2 or 3 per cent., provided that a somewhat larger proportion of oxide of zinc is employed with the high proportions of oxide of cerium. There would seem to be some advantage in the use of larger proportions of oxide of cerium in the quality of light produced; but the amount of oxide of cerium which gives the maximum result depends to a certain extent on the concentration of the solution used—the proportion of oxide of cerium diminishing as the solution is more concentrated. The exact proportion of cerium and zinc required to give a maximum light depends to a certain extent on the fineness of the threads of the fabric used for the mantle; but these matters are, he says, capable of easy experimental determination in practice so as to obtain the best result under given circumstances, and do not need further directions.

In practice, it may be found convenient to use a somewhat larger proportion of oxide of zinc than 1 to 3·28, so as to counteract the accidental loss in manipulation when the mantle is exposed to the action of the flame. Not unfrequently a portion of the zinc becomes reduced and passes off, by the fact that the mantle has not been kept in the oxidizing zone.

Burning-Off and Seasoning Incandescent Mantles.—MacKean, W., of York Street, Westminster. No. 4302; Feb. 28, 1901.

This invention relates to apparatus for burning-off and seasoning incandescent mantles, comprising a row of compound burners and annular and rekindling jets, a cock or cocks for their supply, also a row of ring-burners, and a vertically sliding bracket connected to clockwork and to a treadle, and adapted to receive a bar carrying a row of incandescent burners.

The apparatus is worked by an operator seated in front of the rows of burners which extend on either hand. The mantles being in raised position, with their heads nearly up to the ring burners, these are lighted, and a short time after, when the fabric of the mantles is kindled, the ring-burners are extinguished and the mantles are lowered by pressing on the treadle—the burning of the fabric continuing to extend downwards. When the burning is nearly finished, the jets of the annular burners are lighted, and these, playing on the insides of the lower parts of the mantles, tend to spread them outwards and prevent them adhering to the burner-tubes. After the carbon has disappeared from the tops of the mantles, the spreading jets are extinguished, and the bunsen burners have their supply turned on, and are lighted by the rekindling jets. The mantles are then all lowered by pressing on the treadle; and then, on the treadle being released, the clockwork gradually raises the mantles, while the bunsen flames act upon them, effecting their shaping and seasoning. This lowering and gradual raising of the mantles subject to the bunsen flames are repeated several times; the operator controlling, if necessary, the raising movement by pressure on the treadle. Finally, the bunsen flames being extinguished, the mantles are again raised and subjected to the action of the ring-burners to strengthen their tops; and the bar carrying the row of mantles, burned and seasoned, is then removed.

Distillation or Utilization of Tar, Pitch, Petroleum, and other Hydrocarbon Mixtures, and the Extraction of Carbon Suitable for the Manufacture of Electrodes, Calcium Carbide, and other Industrial Products.—Gaster, L., of Maida Vale, W. No. 6739; March 30, 1901.

In the course of his specification, the patentee remarks: It is known that tar usually contains more or less free carbon in suspension, which carbon retards the distillation; and at the higher temperatures, when the specific gravity of the liquid has been reduced by expansion, the carbon forms a deposit. It is desirable, therefore, to separate the free carbon from the tar; whereby at the same time the wear and tear of the apparatus is reduced, and the quality of the bye-products is improved. Attempts have been made to separate the free carbon from coal-gas tar before distillation, by first mixing the tar with light oils, and causing the mixture to enter a highly-heated retort, in order to deposit the carbon on the walls of the retort. It was proposed to scrape off and collect the carbon thus separated, for use for electrical purposes. The oils which would be evaporated in such a retort, and could be subsequently recovered by means of condensers, consist partly of the light naphtha or other volatile oil which had been used as a solvent, and partly of the other constituents of tar—such as heavy naphtha, anthracene, and other heavy oils. If the retort contains a mixture of tar and volatile solvent, the cooling or pitch collecting pot into which the vapours pass from the retort will contain not only the condensed heavy or pitch oils, but also the intermediate oils—that is to say, the major portion of the oils, which are heavier than the solvent used, but lighter than the heaviest pitch oils—boiling above 270° C. In order to separate these intermediate oils from the pitch oils, the mixture must be subjected to distillation in a separate apparatus; and as the separation only takes place at a high temperature, a portion of the oils contained in the mixture will be decomposed, thereby again forming free carbon which contaminates the mixture, and has to be separated.

In order to avoid these defects, he proposes to extract the carbon at an intermediate stage in the distillation of tar derived from ordinary

gas-works or coke-ovens. That is to say, he first distils the tar until it approaches or attains the consistency of pitch, which usually occurs at a temperature above 260° C. He then interrupts the distillation, and adds to the partly cooled pitch left in the still a sufficient quantity of naphtha or other light oils for dissolving the major portion of the viscous matter contained in the pitch. The quantity of volatile solvent to be mixed with the pitch depends on the amount of pitch and the nature of the solvent, and is therefore variable within wide limits. As a rule, 1 kilo of pitch for 1 to 3 litres of naphtha is a suitable proportion. When the solvent is added to the hot pitch and allowed to act, some of it may be caused to evaporate by the temperature of the pitch, and the vapours thus formed are condensed for subsequent use. He separates the free carbon from the mixture of solvent and pitch by means of a heated retort, which receives the mixture either directly from the mixing vessel or after partial separation of the free carbon has been effected by allowing the mixture to stand, or by treatment with a centrifugal machine or other mechanical means.

In the retort, the volatile solvents and the heavy oils (pitch) are separated in the shape of vapours from the free carbon, and are conducted to a cooling or pitch-collecting pot, where they are collected, and, if necessary, mixed with other oils (like creosote, anthracene, &c) for obtaining the desired quality of the pitch—that is to say, soft or hard pitch, or pitch having the desired softening point, adhesiveness, and consistency, according to its particular application, such as the manufacture of block fuel or varnish. If, however, the retort contains a mixture of tar and solvent, instead of pitch and solvent, the cooling or pitch-collecting pot will contain a sufficient quantity of intermediate oils to render subsequent distillation necessary.

Moreover, if a mixture of tar and solvent is supplied to the retort, the solvent has to dilute not only the pitch oils, but also the intermediate oils. Consequently, more solvent (about 30 per cent. more) will be required for diluting the tar necessary for obtaining a given quantity of free carbon than for diluting the pitch necessary for obtaining the same quantity of carbon; and the capacity of the retort, stills, and auxiliary apparatus must also be greater.

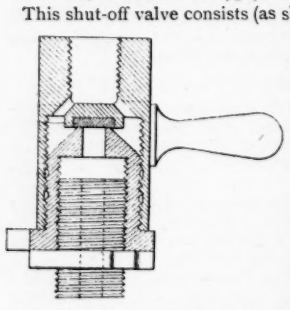
If pitch is used instead of tar as a raw material, the subsequent separation of the volatile solvent from the mixture takes place easily and completely, without decomposition of hydrocarbons, and consequently without the formation of free carbon; and the pitch resulting from the separation is therefore superior to ordinary pitch as regards its applicability to the manufacture of black varnish, or as a binding substance in the manufacture of block fuel.

Burning-Off Incandescent Gas-Mantles.—Janz, J., of Berlin. No. 6952; April 2, 1901.

This invention relates to apparatus for simultaneously burning-off and shaping a large number of impregnated incandescent gas mantles. The principle of the invention consists in causing the mantles, when suspended in a row for the final burning process, to rotate, and in actuating the pressure-gas burners, which are situated under the mantles in their axes, to be moved up and down simultaneously. This rotary motion is for the purpose of overcoming the effects of draughts—preventing the mantles burning on one side or unevenly; and the up-and-down motion is intended to ensure that all parts of the mantles come into contact with the pressure-gas burners, so that they are uniformly shaped and heated. The invention embraces detail devices for conveniently carrying out the burning-off process.

Shut-Off Valve Device for Gas Pipes and Nozzles.—Lucas-Girardville, P. N., of Paris. No. 7327; April 9, 1901.

This shut-off valve consists (as shown) of a cylindrical cap having an externally coned orifice, an inner screw-thread adapted to take on to the thread of a gas-pipe or nozzle, and an external screw thread, provided with two grooves—the upper to hold a lubricant, and the lower to contain suitable packing to prevent the escape of the lubricant. On to the cap is screwed a second cylindrical cap, provided with an internal screw-thread adapted to screw on to the outer thread of the first cap, and having a threaded opening at its upper end, the closed inner end of which has a recess on its underside filled with soft metal, adapted to press upon and close the coned orifice of the first cap, and oblique passages adapted to allow the gas issuing from the coned orifice of the first cap to escape through the threaded opening of the second cap. For shutting off the gas supply to the burner, the second cap is turned upon the first one, so as to bring the soft metal valve close down upon its conical orifice—thus cutting off the supply of gas to the oblique channels. The turning of the cap is facilitated by providing it with a handle or stud, which at the same time serves as an index to show (by its position) whether the valve is open or closed.



Internal Combustion Engines.—Lanchester, F. W., of Birmingham. No. 10,500; May 21, 1901.

This invention (relating to the ignition and oil-supply arrangements for internal combustion motors) refers more particularly to those in which electrical ignition is employed and liquid fuel is used,

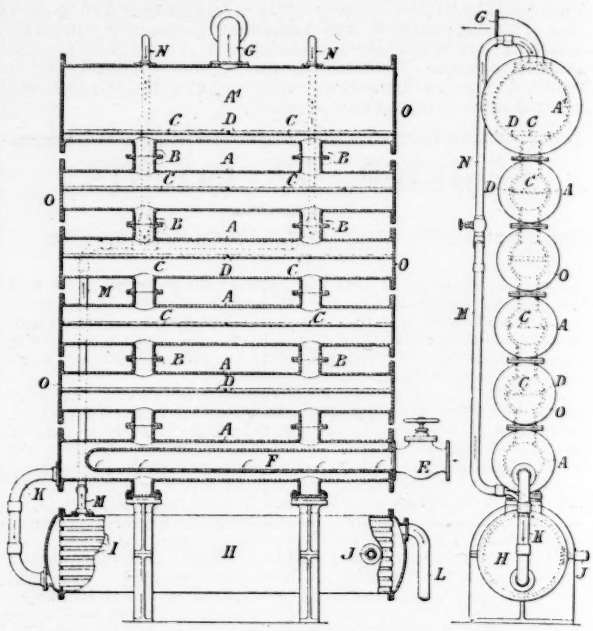
The objects aimed at are to provide: First, an improved arrangement of the electrical contact-making device, whereby the time of the ignition is automatically adjusted to changes in the speed of the engine; and, secondly, an improved means for delivering at each working stroke of the engine a measured quantity of oil for the formation of the combustible mixture.

The first part of the invention consists in mounting one of the "contacts" on a shaft driven from the main shaft of the engine, so that a limited relative movement is possible between the contact-piece and the shaft with which it normally revolves; also in providing a centrifugal device which operates on the contact-piece to produce the relative movement when the speed of the engine exceeds a predetermined rate—thereby effecting the necessary variation in the timing of the ignition.

Distilling Ammoniacal Liquor.—Scott, E. G., of Talbot Court, E.C. No. 11,082; May 29, 1901.

This invention is applicable to that class of distillation wherein the liquor to be treated comes into direct contact with steam. In order to obtain a "thoroughly accessible still" and at the same time reduce both cost and waste space, the patentee proposes to construct his still of what may be described as a series of pipes, with branches top and bottom, and inside each a perforated plate formed as a tray.

In the illustration, A are these pipes forming the body of the still, and B the branches formed upon the top and bottom of them, and flanged in order that they may be connected together so as to form the series of pipes into a complete still. The uppermost pipe is connected to a drum A^1, which forms a separating chamber for the mixed steam and



vapour which rises through the still. C are perforated plates inside each pipe and the drum, so as to form trays therein. Each tray is made with edges D, and in two sections; so that each perforated partition is practically in the form of two trays. This causes the liquor descending on each side of the still to remain within the limits of the two sets of trays, on the right and left hand side respectively; and thus the descending liquor is divided into two streams, a right and a left-hand stream. E is the steam inlet-valve, and F is a perforated pipe arranged inside the lowermost of the still pipes, and through which the steam escapes into the still. G is the outlet through which the vapour distilled passes away from the still. H is a heater (of ordinary construction), comprising a cylindrical casing having perforated end plates between which are secured a number of tubes I. The liquor to be heated enters the cylindrical drum H through the inlet J, and is heated by the spent liquor which passes from the lowermost pipe of the still, through the pipe K, and through the pipes I, finally escaping through the outlet-pipe L. The heated liquor is conveyed up through the pipe M, which is divided into two branches N entering the top of the separating chamber A^1 as shown.

With this arrangement, the liquor from the heater H is introduced into the separating chamber A^1, so as to fall upon the two perforated trays C therein. After passing through these trays, it flows down the branches B on to the trays D in the topmost pipe A. In this manner, the liquor gradually passes from pipe to pipe, until it finally (in a spent condition) flows into the heater H, through the pipe K, to subject the cold incoming liquor to preliminary heating. The steam and the vapour distilled from the liquor under treatment are separated in A^1; and the vapour escapes, through the outlet-pipe G, to the saturator or condenser.

The pipes are closed with covers O, which can be removed when it is required to clean the still. When the covers are removed, the internal trays can be easily withdrawn, brushed, and replaced.

Acetylene Gas Lighting System.—Toltz, M., and Lipschutz, A., of St. Paul, Minnesota, U.S.A. No. 24,577; Dec. 3, 1901.

The object of this invention is to provide for the safe storage and distribution of acetylene for lighting purposes, and "to accomplish the compression, storage, and distribution of acetylene gas, with means that will insure absolute safety."

A particular danger arising in the use of acetylene gas, the patentees point out, grows out of the fact that, when any portion of a body of confined and compressed acetylene is heated to about 1432° Fahr., the gas dissociates, which physical change is imparted to the whole body of gas—"resulting in an explosion of serious character." On the other hand, if in the presence of such heat dissociation can be localized, by providing a free outlet for the gas from any pipe or reservoir containing it, all explosions are to be avoided. The safe and successful use or employment of acetylene gas for lighting purposes is, therefore,

dependent not alone upon the generation and preparation of pure gas, but mainly upon the character of the means used in its distribution. The particular object of the present invention, therefore, is to provide (in connection with generating and compressing means of suitable character) a "complete system of gas distribution, which shall include only elements which are absolutely safe." To this end, the invention consists in the combination—preferably with generating and compressing means for acetylene gas—of a storage-tank, with a service-tank, gas-burners, and suitable piping or connections, which are fusible at a low temperature, or are provided with fusible parts or devices capable of dissolution in case of fire or great heat in proximity to the apparatus or any part of it, and at a comparatively low temperature, and whereby, in case of fire, the gas is permitted to escape freely and burn quietly instead of exploding.

APPLICATIONS FOR LETTERS PATENT.

8618.—Clapham, W. S., "Purification of coal, oil, and like gases." April 14.
8656.—Tysoe, J., "Fastening for the covers of gas-purifiers." April 14.
8661.—Boult, A. J., "Production of gas for lighting and other purposes." A communication from H. Reeser and P. Zeitz. April 14.
8678.—Burrows, G. H., "Air and gas mixing apparatus." April 14.
8688.—Garde, H., "Carburetting air." April 14.
8704.—Crossley, W. J., and Webb, W. le P., "Internal combustion engines." April 15.
8713.—Hislop, G. R., "Gas-producers." April 15.
8779.—Guigne, B., "Acetylene gas-producing apparatus." A communication from A. Borrelly. April 15.
8833.—Hobday, H. J., "Chandeliers and brackets." April 16.
8834.—Lindley, S., F. A., & J. E., "Valves or cocks for controlling the supply of gas for street-lamps and other services." April 16.
8889.—West, J., "Chains for coke-conveyors." April 16.
8927.—Whitelow, E. T., "Gas-compressors." April 17.
8930.—Pidgeon, W. R., and Bradley, E. F., "Internal combustion engines." April 17.
8931.—Smith, T. W., "Incandescent gas-burners." April 17.
8951.—Otto, E. C. F., E. C. F., jun., M. L., & E. A., "Internal combustion engines." April 17.
8957.—Atherley, F., "Carburettors." April 17.
9039.—Sieverts, W. H. A., "Incandescent gas-burners," April 18.
9041-2.—Berthold, C. E. J., "Automatic igniter for gas-burners." April 18.
9054.—Charlopin, C. L., "Incandescent burners." April 18.
9065.—Dorian, G., "Burners for gas and the like." April 18.
9069.—Liehermann, L. S., "Gas-burners." April 18.
9070.—Smith, H. W., and Albright, G. S., "Purification of coal gas and recovery of bye-products." April 18.
9071.—Husband, J., "Coin-freed meters." April 18.
9105.—Platt, J., "Anti-vibrator for gas-burners." April 19.
9129.—Warren, W. P., "Gasholders for acetylene." April 19.
9136.—Graham, M., "Hot-coke conveyors." April 19.

Water-Meters for Waste Prevention.—The use (and waste) of water has become so great in Rockford (Ill.), that it is necessary either to increase the plant of the Water Department or to curtail waste. The latter is the plan recommended; the project calling for a working appropriation of about $5000. With this sum, from 350 to 400 meters can be purchased and placed on those services where there is the greatest probability they are needed. They will be charged at cost price to the consumer, as is the case with service-pipes; and with the money thus obtained, more meters will be purchased.

The Arrol-Foulis Hydraulic Stoking Machinery.—This machinery has been working some two years in one of the retort-houses at the Bromley-by-Bow works of the Gaslight and Coke Company, and we learn that the Directors have placed a further contract with Sir William Arrol and Co., Limited, for additional plant for another retort-house at this station. The new plant will consist of further drawing and charging machines, as well as elevators, coal-breakers, and hoppers, all of the latest type. The makers have recently increased the speed of their drawing and charging machines considerably, so that only one pair of machines, on each side of the bench, is now generally required, even in the largest retort-houses.

Trade Unionists and the Taff Vale Decision.—The Management Committee of the General Federation of Trade Unions have issued a report on the protection of Union funds in the light of the dangers disclosed by the recent Taff Vale judgment. They suggest that a short Bill of one clause should be submitted to members of Parliament, and that it might read as follows: "A Bill to define Liability of a Trade Union. No action shall lie against a Trade Union for the recovery of damage sustained by any person whatsoever by reason of the action of a member or members of a Union, or persons acting on his or their behalf, unless it be proved that such member or members or persons acted with the directly expressed sanction and authority of the Trade Union rules."

Bombay Gas Company, Limited.—In the report to be submitted to the shareholders of this Company at the ordinary meeting on the 8th prox., the Directors state that, compared with 1900, the Company's business last year showed satisfactory progress. The revenue from private rental was greater by £2085; but the expenditure on coal was also greater, by reason of the larger quantity necessary and the higher prices paid. After adding £1500 to the reserve fund, and deducting the interim dividend paid on the 1st of December last (£7200), the balance available for distribution, with the amount brought forward, is £9041; and the Directors recommend a dividend of 3½ per cent., free of income-tax (making 6½ per cent. for the year), carrying forward £641. The Directors report with much regret the death of their esteemed colleague Mr. Frederic Lane Linging; and they have appointed Mr. Edward Alfred Flinders (late an Auditor of the Company) to fill the vacancy on the Board. They have also appointed Mr. Louis Penny, who was for many years the Company's Manager at Bombay, to fill the vacant auditorship.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

Carburetted Water Gas as an Enricher.

Sir,—My attention has only recently been called to the two communications you have had from Mr. Glasgow, condemning the action of the Commercial and (I presume) the South Metropolitan and West Ham Gas Companies in obtaining relief from Parliament from the obligation to enrich their gas above the power furnished naturally by the coals available.

It is somewhat singular to find that an irresponsible outsider—not even affected as a shareholder—should so freely criticize the policy of those responsible for the successful administration of the undertakings in question; and the discretion of such a criticism is the more to be doubted when one remembers that the critic is directly connected with the firm which is chiefly concerned in supplying gas companies with plant for enriching gas.

Surely he should have remembered that this interest discounts heavily his condemnatory reflections; while those whose action he decries are at least entirely free from any interests which would sway them from the most impartial judgment in the matter—to say nothing of the heavy responsibility they are under to the consumers and shareholders of the undertakings they administer.

Of what use is it to pose upon the present abnormally low price of oil, and speak (as if it were permanently possible) of making carburetted water gas suitable for enrichment at 1s. per 1000 cubic feet. Only last year the price of the oil was more than double the present price, and both coal and coke were at least 50 per cent. higher.

Will Mr. Glasgow formulate his proposition in detail; and then we shall see by what omissions or oversight he has arrived at the conclusions on which he ventures to base his condemnation. He certainly owes us this at least.

Hy. E. Jones.

Commercial Gas-Works, Stepney, April 26, 1902.

Gas Companies and the Sale of Incandescent Burners.

Sir,—It is stated in your issue of the 22nd inst., under the heading of "Experiences in Incandescent Gas Lighting at the Antipodes:" "The figures as to the number of burners sold by the Melbourne Company are truly remarkable; and we know of no gas company in this country who could say that last year they sold 9800 incandescent burners, or, in fact, anything more than a shadow of that number."

The numbers of Welsbach incandescent burners sold to private consumers by this Company the past three years have been as follows:—

1899	7,490
1900	10,696
1901	14,843

There has been, in addition (more especially during the past twelve months), a large number of Welsbach and infringement burners sold by shopkeepers in the town.

Hanbury Thomas,
General Manager and Secretary, Sheffield United Gaslight Company.

Sheffield, April 23, 1902.

Illuminations and the Probable Demand for Gas on Coronation Night.

Sir,—Some years ago, while engaged upon local illuminations, it occurred to me that possibly lead might be used for such purposes, instead of iron, or other material. To test the question, I pierced a piece of lead pipe at intervals of 1½ inches, and placed it vertically, so that when lighted the flames ran one into another, and made a continuous line of fire. At the end of six hours the gas was turned off, and the pipe was found to be quite unaffected.

I was too far advanced with the work I was engaged upon to avail myself of this knowledge on the occasion referred to, and have never had an opportunity of putting it into practice since. But I think gas managers and others would do well to convince themselves of the reliability of the material, for it offers so many advantages over any other. Iron costs much time and labour to work, and is valueless after use. Lead is dealt with in one-sixth of the time, and, as pig, will realize within 4s. per cwt. of its original cost. Its most evident advantage is in the outlining of buildings; but it is also admirable for italic capital letters and floral borders. Please note I am referring to *lead*, not "compo," pipe.

Now a word as to the probable demand for gas on Coronation Night. You, Sir, seem to have an impression that it will be abnormally large. My experience leads me to expect the reverse, and I shall be greatly surprised if in towns of any size—and London more particularly—the demand much exceeds that of a Sunday. These illuminations are very imposing in main thoroughfares and particular centres; but they hardly compensate for thousands of houses left tenantless and dark.

Henry Woodall.

Queen Anne's Mansions, S.W., April 25, 1902.

The "Positive" Meter.

Sir,—On reading the suggestion in the "Editorial Notes" on the Eastern Counties Association meeting in the last number of the "Journal" (p. 1006), I at once wrote to Mr. Shadbolt; and it is now arranged that we shall make a joint examination, as proposed.

On p. 1023, you report me as having confessed that valves were "the worst part of the dry meter." This is an error—probably caused by some unfortunate choice of words on my part. What I did confess was that I had not seen my way to do without valves in the "Positive" meter, any more than engineers had in steam-engines. I said valves were an equal necessity in steam-engines, dry meters, and the "Positive" meter.

I do not consider that the valves are the worst feature of a dry meter. The leather diaphragms are the weak point in the dry, and they are the cause of much of the valve trouble, because the oil with which they are saturated is carried up on to the valve-faces.

John Greenall.

Leeds, April 25, 1902.

PARLIAMENTARY INTELLIGENCE.

GLEANINGS FROM THE COMMITTEE ROOMS.

SINCE the reassembling of Parliament after the Easter recess, Gas and Water Bills have not been very conspicuous in the Committee Rooms. The explanation in regard to Gas Bills is that there can be but few remaining which will call for investigation in Committee; and even that few may drop into an unopposed state before the Committee stage is reached. Year after year agreement over prom nent gas measures seems to become more frequent; but in regard to Water Bills, it is quite natural, as so many external interests as a rule are affected, that opposition should be more rife and difficult to dispose of. The great London Water Bill is the one which is now almost monopolizing the attention of experts whom we are in the habit of seeing about the rooms and lobbies when Water Bills are in Committee. The Joint Committee who are considering that measure have not taken possession of one of the ordinary Committee rooms; but they have established themselves in Committee Room A, which lies within the sacred precincts of the House of Lords. It bears a strong family likeness to the we l-used rooms in the upper corridor, but still there is an air of superiority about it. It is of goodly size; but for the large number of persons engaged on the measure, its accommodation is far too limited, and at times it is even difficult to obtain comfortable standing room. Counsel, Water Works Experts, Water Companies' officials, and London County Council officials and others, are mixed up gloriously. To them, the proceedings may possess a very profound interest; but to the ordinary individual who has no particular personal concern in the matter, the questions involved are too big to have any lasting attractiveness. There is no occasion to deal with them in these notes, as, week by week, the special features are dealt with in our "Water Affairs." In regard to Private Bill proceedings, there were only two measures last week which had any prominent connection with the gas industry. One was the Longwood Gas Bill, and the other the Omnibus Bill of the Bradford Corporation. The Longwood Company carried their Bill through, being completely victorious; and as the gas section of the Bradford measure was not opposed, we shall soon find that city the owners of three additional gas undertakings. The water section of the same Corporation measure went through safely. Among others, the Bristol Water Company and the Buxton District Council were also successful with their new proposals.

Longwood v. Huddersfield. Among gas companies, there will be an amount of sympathy felt for the Longwood Gas Company over the opposition which their Bill encountered from the Huddersfield Corporation when in Committee at the beginning of last week. The objects of the Bill were of the ordinary character in present-day gas legislation. There was the conversion of the capital into stock with a uniform rate of dividend, the adoption of the sliding-scale, additional capital powers, and authority to purchase the works of the Colne Vale Gas Company. The opposition of the Corporation arose from a plausible, but nevertheless in the circumstances unfair, desire to secure, for the consumers in Longwood proper, gas on the same terms as the consumers of Lindley (who are also supplied by the Company) obtain their gas at—viz., at a price not exceeding that for the time being charged by the Corporation of Huddersfield to consumers in other parts of Lindley. That was a condition introduced by the consent of the Company in their Act of 1875. Lindley at the time had been absorbed by the Corporation by an extension of their bounds; and in 1890, the limits of the Corporation were again extended, so as to include the whole of Longwood. But in the Order under which the extension was made, is a clause which reads: "Nothing herein contained shall be construed to extend the limits within which the Corporation may supply gas." Now the Corporation opposed the present Bill for the purpose of getting the insertion of a clause to empower them to purchase the Longwood portion of the Company's undertaking, or alternatively they asked that the Company should be compelled to supply Longwood consumers at the same price as was charged in Lindley. While, no doubt, the Corporation's idea was to place the whole of the gas consumers in their district on an equality, the term "impudent" which Mr. Corbet Woodall applied to their proposals was none too strong. Both suggestions were shamefully unfair; and we do not think the Corporation advisers could have taken a full survey of the whole position. No one knows better than Mr. E. H. Stevenson that Parliament have never allowed the amputation of a portion of a Gas Company's undertaking in the manner proposed; and the defeat of Bradford over a similar application is not a matter of such ancient history that it should have escaped his memory. As to the suggestion that the price of gas in one part of the Company's district should be restricted to that of another concern is likewise unjust. The Longwood Company were in possession of the Longwood district long before Huddersfield obtained authority to extend their borough boundaries so as to include it; and why the latter should be privileged now to be the channel through which a compulsory limitation of price should be inflicted upon the Company—possibly to the detriment of the Company's consumers who have not the honour of residing within the Corporation boundaries—passes the comprehension of a common-sense man. Both propositions exceed all reason and propriety. Argument during two days did not convince Lord Stanmore's Committee of the righteousness of the proposals; and the Corporation g ined absolutely nothing by their intermeddling in the Company's affairs. We congratulate the Company and their Engineer and Secretary (Mr. J. H. Brearley) on the successful defence of their rights.

The Gas-Works Deals of Bradford. The Bradford Corporation Bill, which contains several parts of great local importance, came before Lord Pirbright's Committee on Thursday afternoon; but only one section—that referring to the construction of new water-works—incurred opposition. Mr. Charles Wood, the Corporation Gas Engineer, was among the city representatives who lined the room; and his presence brought to mind the fact that the Bill embraces clauses which enable the Corporation to purchase the undertakings of the Clayton, Allerton, and Thornton, the Airedale (Idle), and the Eccleshill and Bolton Gas Companies' undertakings upon agreed terms, with authority to sell the outlying portions of the acquired undertakings to the Local Authorities concerned. To this piece of wholesale municipalization, there was no objection raised; but we believe the Local Government Board have advanced a little point about the application of certain Local Acts. Evidently that difficulty, whatever its nature, was overcome; for the preamble of the Bill was found by the Committee to be proved. The responsibilities of the Chief Gas Engineer of Bradford are certainly growing at a remarkable rate.

Bradford's New Water Proposals. The fighting part of the Bill, as already stated, related to the water-works; and Leeds, Pudsey, and Calverley were the opponents. A little explanation is required to show the ground of their objection to the powers sought. The water-works of Bradford are not only laid out for the supply of the city, but for adjoining districts. Farsley, Calverley, and Pudsey are adjacent towns, and are supplied by the Corporation; but the first-named one did not oppose. In connection with the Corporation new Nidd works, some little difficulty has been found in regard to the distribution of the water; and it is now proposed to construct certain service reservoirs in Calverley and Pudsey. Leeds claim concurrent rights of supply in these places; but Bradford contend that the right is theirs, and that they are able and willing to supply. Pudsey and Calverley also maintain that they are not within the statutory limits of Bradford's water supply, and ought to be allowed to preserve their independence. There was a good deal of reference to old Acts during the proceedings, to prove the case of Bradford. From what is here stated, it will be seen that their Lordships were called upon to give an interpretation to a point of some difficulty. Leeds fought hard to have their rights to supply recognized; but it was evident the Committee were throughout favourably disposed towards the promoters, who are already supplying the districts in question; and, early the second day, the Committee declared that, in their opinion, the right to supply belonged to Bradford and not to Leeds. There is an agreement in regard to the supply to Pudsey by Bradford which holds good until 1913; and Pudsey want in that year to be at liberty to get their supply in the cheapest market, which, they think, will be found in Leeds. Bradford, however, apart from the question of right, assert that Leeds have not the means to send water to the altitude of Pudsey. Like Pudsey, Calverley desire to be left perfectly free to obtain their supply from the best market; and they hold that Bradford has not the right of supply otherwise than in bulk. The fight was carried on sharply by all the three opposing bodies to the end; and both Mr. James Watson, the Water Engineer of Bradford, and Mr. James Mansergh, who gave the Bill strong support, were subjected to considerable examination. However, in the end, the Committee smoothed over the troublesome point for the present by altering the words in the preamble "to fulfil their obligations" in respect of the water supply to the districts of Calverley, Farsley, Pudsey, &c., to "to exercise their powers." The Bradford representatives saw no objection to this; and the Committee found the preamble proved. It is clear that a few years hence will see the question again under discussion.

Slot Meters for Birkenhead. Among the financial provisions of the Omnibus Bill promoted by the Birkenhead Corporation was one which proposed the raising of £15,000 for the supply of prepayment gas-meters. The Chairman of the Commons Committee (Mr. Bill) who considered it, did not apparently know much about the popularity of the slot meter; and he expressed the opinion that £15,000 was rather a large sum for the purpose. The Town Clerk (Mr. Gill) informed him that it would extend over a considerable period—probably ten years. It was wise of the Town Clerk not to be too specific; and the use of the term "probably" may save him a little regret in less than ten years. Pursuing the conversation, the Chairman also asked if the slot business was a paying one; and Mr. Gill was able to emphatically reply "Yes; we make a large profit out of the gas so supplied." Mr. Bill was satisfied; and he allowed the Corporation Bill to go forward with the slot-meter borrowing powers intact.

Protecting Bristol Water. There was, for a few days, every appearance that the Bill being promoted by the Bristol Water Company would not claim the attention of the Committee of the Lords of which Lord Stanmore is the Chairman. In the first place, in the belief that the opposition of the Corporation (the then only remaining petitioner) had been withdrawn, the Bill was struck out of the Committee list last Thursday week; and then it was reinstated. On the following Monday, the Bill was due for consideration; but the Committee very courteously permitted it to remain over for another day at the request of the parties. By Tuesday, promoters and opponents had arrived at an agreement, excepting on one point; and therefore the Committee were not engaged very long in disposing of the measure. This was rather pleasant, as at one time the Bill was threatened to such an extent that it was thought desirable to retain four Counsel to defend it—three being wearers of the silk. The main purpose of the Bill is a protective one. It is the acquisition of land for the purpose of shielding from pollution the Yeo reservoir. In the Bill new capital to the amount of £280,000 is asked for, with one-fourth loan, and other proposals refer to additional works in connection with the Yeo scheme. The only point outstanding between the Company and the Corporation when the Bill reached the Committee, related to proposed differential rates in Stapleton, Horfield, and Brislington; and a very little informal discussion before their Lordships brought the parties into final agreement—it being decided that the differential rating should terminate at the end of 1909. Therefore, practically all the Committee had to do was to declare the preamble proved, and report the Bill for third reading.

A Big Water Scheme for Buxton. It was a water scheme of some magnitude with which the Buxton District Council confronted Lord Stanmore's Committee after the disposal of the Bristol measure; and several interested parties put in an appearance in opposition—the result being that three days' sittings were required for its disposal, and a little time yesterday for considering

the clauses. The total estimate of the cost of the proposed works is £171,000; and the scheme includes the acquisition of land and the construction of two reservoirs. Nottingham, at the outset, was granted limited *locus standi* in opposition to the Bill; but it turned out that their hostility had some bearing upon the pollution of water which passed Nottingham in the Trent. On the last day of the hearing, the city's representatives were sent disconsolate away, with a parting remark from the Chairman that, had the Committee grasped the facts earlier, the *locus* would have been refused altogether. The other opponents, who were owners or occupiers of property on the River Wye, brought before the Committee fair matter for discussion. Their principal object was to secure that pure water should not be taken from the river and impure water be returned to it. But, for the promoters, it was pointed out that the Council are asking the Local Government Board at the present time for power to borrow money for the purpose of purifying the sewage and putting into the river a perfectly pure effluent. There was a large mass of evidence in support of the proposals of the promoters and the Committee were satisfied as to the necessity for the new works. The upshot was that the preamble was declared proved, subject to the insertion of clauses providing that the effluent from the sewage-works shall be turned into the river at a point to be agreed upon a short distance below the town, that the promoters shall carry out new sewage works before taking more water by the new scheme, and that the outflow of the water-works shall pass down the river.

An Unreasonable Request. There was not much excitement in Lord Pirbright's Committee's room when the Water Bill of the Abertillery District Council came up for consideration—the reason being that there was only one opponent, and that was the Lancaster Steam Coal Collieries, Limited. They sought to impose a most unusual condition on the Company. The main purposes of the Bill are to get power to extend a dam in connection with a new reservoir on the Tillery which has given some trouble; and while in Parliament the promoters thought it wise, in view of the rapidity with which the population is extending, to get authority to construct a second reservoir on the same stream. The usual clauses to take the land in three years, and to construct the reservoir within seven years, were inserted in the Bill; but the opponents wanted to compel the Council to buy the land and the coal underneath it directly the Bill was passed. This was unreasonable; but, before the proceedings went very far, the promoters engaged to commence the construction of the reservoir within two years, or to get a supply of water from elsewhere, either by coming to Parliament again, or going to some other sources of supply. This was accepted by the opponents; and the preamble was declared proved. It was mentioned during the proceedings that the cost of completing the present reservoir will be £10,500, and the cost of the new one about £35,000. In addition to these sums, between £7000 and £8000 are required for other purposes.

Rathmines Water. A Bill for various powers promoted by the Rathmines and Rathgar District Council has passed through Committee in the Commons. There is only one part of it in which we are concerned, and that is the application for power to borrow £15,000 for the water undertaking. This was allowed; the period of repayment being 60 years.

Darley Dale Water. The principal provisions in the Bill promoted by the Darley Dale District Council have reference to the enlargement of the water-works, at an estimated cost of £25,000. The only noteworthy alteration that has been made in the measure during the Committee stage is that the period for repayment of working capital is reduced to 20 years.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bill brought from the Commons, read the first time, and referred to the Examiners: Kent Water Bill.

Bills read a second time and committed: Barking Gas Bill, Commercial Gas Bill, Grand Junction Water Bill, Higham Ferrers and Rushden Water Board Bill, Omagh Urban District Gas Bill, Ticehurst Water Bill, West Ham Gas Bill.

Bill reported: Finedon Urban District Water Bill.

Bills reported, with amendments: Abertillery Urban District Council Bill, Longwood Gas Bill, Newcastle and Gateshead Water Bill, West Hampshire Water Bill.

Bills read the third time and passed: Chigwell, Loughton, and Woodford Gas Bill, Finedon Urban District Water Bill, Swindon United Gas Bill, Wadhurst Gas Bill, West Hampshire Water Bill.

Petitions against the Commercial Gas Bill have been presented by the London County Council; and against the West Ham Gas Bill, by the Leyton and East Ham District Councils, the Barking and Ilford Gas Companies, and certain owners of houses in East Ham.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills brought from the Lords, read the first time, and referred to the Examiners: Chigwell, Loughton, and Woodford Gas Bill, Swansea Corporation Water Bill.

Bills reported, with amendments: Belfast Corporation Bill, Birkenhead Corporation Bill, Bournemouth Gas and Water Bill, Caterham and District Gas Bill [Lords], Darley Dale Water Bill [Lords].

Bill read the third time and passed: Kent Water Bill.

At Folkingham, a small town in South Lincolnshire, the Gas Company (one of the oldest in the district) is to be wound up by voluntary liquidation; and the works have now been closed. Oil has, consequently, been introduced as a means of lighting; but considerable inconvenience has been caused.

HOUSE OF LORDS COMMITTEE.

Tuesday, April 22.

(*Before Lord* STANMORE, *Chairman, the Earl of* CARNWATH, *Lord* CROFTON, *Lord* DENMAN, *and Lord* MASSY.)

LONGWOOD GAS BILL.

The Bill to authorize the Longwood Gas Company to convert their existing share capital into stock bearing a uniform rate of dividend, raise more money, purchase the works of the Colne Vale Gas Company, and for other purposes, came under consideration to-day.

Mr. BALFOUR BROWNE, K.C., and Mr. WAUGH appeared for the promoters; Mr. RAM, K.C., Mr. HARPER, and Mr. MORGAN MORGAN represented the Huddersfield Corporation, the only opponents.

Mr. BALFOUR BROWNE, in opening the case, said the Bill was to confer further powers upon the Longwood Gas Company, which was registered on March 26, 1859. It was a local concern, composed of gentlemen who were living in the district, where there was then no gas supply. They decided to provide it themselves; and as they started in a small way, they had to ask a large price—viz., 6s. per 1000 cubic feet—for their gas. As the district increased and the Company became more prosperous, they were advised that it would be necessary to apply to Parliament for an Act; and in 1875 they obtained one, and were established as a statutory undertaking. The area supplied included the districts of Longwood, Lindley, Linthwaite, and Golcar, and slightly to the east of these places was the district governed by the Corporation of Huddersfield, who, in 1871, were empowered to purchase by agreement the gas-works in the town. By their Act of 1875, the Company consented to the introduction of section 55, which declared that the part of Lindley-cum-Quarmby, which had become a portion of the borough, and was within the Corporation limits, should be supplied at a price not to exceed that for the time being charged for gas by the Corporation to consumers in other parts of Lindley. In 1877, the Company were able to reduce the price to 4s. in their district and 3s. in Lindley, which they were not bound to do. Since then, owing to the prosperity of the Company, the price had been further reduced from time to time. In 1879, it was brought down to 2s. 9d. in Lindley and 3s. 6d. in the other parts of their district. In 1885, Lindley remained at 2s. 9d.; but the other places paid 3s. 3d. In 1895, Lindley still paid 2s. 9d., and the other districts 3s. The Company also allowed certain discounts—5 per cent. for lighting and 15 per cent. for cooking—for prompt payment. The concern had been exceedingly well managed, one indication of this being that, notwithstanding the abnormally high price of coal during the last two years, which had caused a large number of undertakings to raise the price of gas, the Company had been able to go on without doing so. In 1890, the borough of Huddersfield was extended so as to include the whole of Longwood; but the Corporation did not want to take away the existing rights of the Company, and a clause was introduced into the Order made by the Local Government Board which set forth that "nothing herein contained shall be construed to extend the limits within which the Corporation may supply gas." The Company had brought in the present Bill for several reasons. They were at the end of their tether with regard to capital, they wished to consolidate the existing capital—a purely domestic arrangement, which did not affect the consumer—and they proposed to purchase by agreement small gas-works and lands belonging to a local Company. The only other matter of importance in the Bill was the proposal to alter the maximum charge for gas to a standard price with a sliding-scale. The capital asked for—£126,466—would enable the Company to keep away from Parliament for twelve years. They asked that the standard price might be 3s. 2d., which was 2d. beyond the actual figure charged. The Bill ought really to be unopposed; but there was one objector—the Corporation of Huddersfield. The petition of the Corporation was most unreasonable, and their interests were not in the least affected by the Bill. There was nothing anomalous in one district being charged at a lower rate than another. If there had been, why did the Corporation make their bargain of 1890? He asked the Corporation to keep to that bargain, as the Company were not trying to break from theirs. They could not afford to supply Longwood at the price charged in Lindley; and if the figure were so reduced in Longwood, the consumers in Golcar and Linthwaite would have to pay more. This was not right. As to the proposal of the Corporation to insert a clause in the Bill for the purchase of a portion only of the undertaking, the policy of Parliament had always been to prevent a statutory company from being expropriated. He did not say that Huddersfield might not warrantably promote a Bill to buy the Company out. But that was a totally different thing from inserting a clause in the present Bill, because if they promoted a Bill they would have to get the sanction of the ratepayers. Besides, if the clause were inserted, it would be doing away with the whole purport of the Borough Funds Act, which was that corporations should not get statutory powers without the consent of their constituents. There had never been a single instance of a clause for purchase being introduced into the Bill of a statutory company. In the present case, the Corporation were asking to cut up the Company's undertaking; and they might be taking away just the bit that paid. Parliament had rejected similar proposals on the part of Bradford to buy up portions of three Gas Companies. There was no precedent for such a thing; and if it were allowed to succeed now, it would be to the disadvantage of the consumers who remained.

The following evidence in support of the Bill was then given.

Mr. *J. H. Brearley*, Engineer, Manager, and Secretary of the Longwood Gas Company, examined by Mr. WAUGH, said the capital had been overspent to the extent of £15,158. Having repeated the figures as to the charge for gas mentioned by the learned Counsel who opened the case, witness said the Corporation of Huddersfield had not made any reduction in the charge in their area. As to the petition of the Corporation, he thought the effect of it upon the financial position of the Company would be disastrous. In order to meet the demands, both present and future, of the Longwood district, the Company had expended large sums of money in laying mains; and they had established a manufacturing station which could produce the whole of the

gas required. If a portion of their district were taken away, a part of the plant would at once become unremunerative, and the result would be to deprive the Company of half their authorized area. They had never had any complaints as to the way in which they had fulfilled their parliamentary obligations; and in recent years they had brought before their consumers the advantages of using gas for cooking purposes. The loss of the district in question would deprive the Company of the full benefit of their labours in this direction. Supposing Parliament were to restrict the cost of gas in the Longwood district as well as in Lindley, the effect would simply be to put a tax upon the remaining portion of the district—Golcar and Linthwaite. Assuming the Longwood area were placed under the same reservation as Lindley, the Company would lose control over the price to be charged on 38 per cent. of their output. The effect of this would be that, although they would be compelled to supply gas and to raise the necessary capital for extension, they would have no control whatever over the charge. In 1875, one clause was inserted in the Act which placed Lindley in an exceptional position as to price. It was conceded by the Company on the opposition of the Huddersfield Corporation. At that time, the Company were not under Act of Parliament, and they then applied for statutory powers. The Corporation opposed their having statutory powers in Lindley, except on condition that they should not supply gas at a higher price than was charged in the rest of the Lindley district. In 1875, when the price was limited in Lindley, they were competing with an existing Gas Company, who were there for the purpose of paying dividends. They now asked to be placed on the same terms as the Corporation of Huddersfield, who did not pay dividends, and who might run the concern at a loss if, in the interests of the ratepayers, they thought it necessary to do so. The promoters had spent considerable amounts in Longwood Ward; and the outlay had been made in good faith, believing that the powers granted by Parliament would not be withdrawn so long as the promoters discharged their statutory duties. Besides getting rid of unfair competition, it was absolutely necessary to have additional lands for the purpose of extending their works. In five years (1896—1900) their make of gas had increased more than 50 per cent.

In cross-examination by Mr. HARPER, witness said he was aware that the Company had been warned in 1875 that the whole question would be raised by the Corporation. He acknowledged that they had £15,000 of unauthorized capital on which interest was being paid; but he said they had called it up because it was absolutely necessary for getting additional lamps. They were paying 4½ per cent. upon the money. Supposing the Bill were rejected, they would still be able to carry on the Colne Vale Company's works by means of an under-lease.

Mr. HARPER read clause 16 of the agreement between the Company and the Colne Vale Gas Company, and suggested that it was a bargain which the promoters were evading submitting to Parliament.

Mr. WAUGH said he really did not understand the suggestion of his learned friend. The promoters did not require the sanction of Parliament to the agreement. What they needed was authority to raise the necessary capital. They did not wish to shirk the question at all. He was told by the Agent that if the agreement with the Colne Vale Company had been put in as part of the Bill, Lord Morley would have struck it out as unnecessary.

Mr. HARPER remarked that a similar agreement was put into a Yorkshire Bill last session.

Mr. *Corbet Woodall* was next called, and gave evidence in support of the Bill. He said he regarded the proposals of Huddersfield as impudent. He thoroughly appreciated the desire of the Corporation to supply the district, but it should not be done to the injury of the existing Company.

The CHAIRMAN (to witness): Have you any knowledge of cases in which a statutory company has jurisdiction over a portion of ground which is not included in the borough area where that borough is itself the gas authority?

Witness: I think there are a fair number of cases; but I am sorry to say my memory does not enable me to give the details. It is not an uncommon occurrence.

Is it more usual, where the borough is the gas authority, for it to take all parts under its own jurisdiction?—Yes. It is perfectly natural for a local authority such as this to desire control over its streets.

In answer to a further question by the CHAIRMAN, witness said the gas undertaking of Huddersfield was not a losing concern, but a very profitable one. Therefore the gas consumers in the district of Longwood, while buying their gas from the Company, were reaping the advantage of profits made from the supply of gas in Huddersfield.

Mr. *R. Porter*, of Elland, followed. He said the proposal of 3s. 2d. as the standard price was a fair one; and he characterized as unreasonable the attempt of the Huddersfield Corporation to acquire a portion of the Longwood Company's undertaking. Bradford and other places had made similar proposals, but unsuccessfully.

Mr. *Crowther*, Chairman of the Golcar Urban District Council, and Mr. *Hayes*, Vice-Chairman of the Linthwaite Urban District Council, supported the Bill; and their evidence closed the promoters' case.

Mr. HARPER at once proceeded to call witnesses to speak to the petition of the Huddersfield Corporation.

Mr. *E. H. Stevenson* said he was well acquainted with the district and its conditions, and he did not consider that the purchase proposed by the promoters would be beneficial to the consumers, although it might possibly be so to the Company. With regard to the amount of capital asked for, £60,000 would be sufficient for 15 or 16 years.

Wednesday, April 23.

On the resumption of the proceedings this morning,

Mr. *Stevenson* was cross-examined by Mr. WAUGH. He said that the standard price asked by the promoters was, in his opinion, too high, and 2s. 9d. would have been sufficient. They were asking Parliament to allow them to pay a 10 per cent. dividend with a price of 3s. 2d.; while they could pay it with one of 2s. 8d. or 2s. 9d. in a normal year, if they did not use their revenue for capital purposes. So far as his knowledge of Yorkshire went, he did not know that 1898-9 and 1900 were the worst years experienced in the memory of any person living there. The returns of the Longwood gas undertaking showed that they were the best years the Company had had in the whole of their experience. When a request had been made to Parliament by an authority to take a portion of a district, it had been simply to take a part of an existing gas undertaking, not a case like this, where the Gas Company asked to be allowed to purchase another undertaking practically of the same size as the portion which the other people wished to take. The promoters asked Parliament to sanction the purchase by them of the gas undertaking of the Colne Vale Company, whereby they would be able to sell pretty nearly the same quantity of gas as they now sold in Longwood and Lindley. This differentiated the case from those which had been brought before Parliament in previous years. The Longwood Company would be making practically the same bulk of gas after losing a district as they were before, and the charges would remain the same. To his mind, if the portion of the undertaking within Huddersfield were purchased and the money invested, the interest upon it would fully compensate for the loss the Company might otherwise sustain; and they would then be in the position of having gilt-edged securities, whereas now they had only a fluctuating security.

In re-examination by Mr. RAM, witness stated that what was first asked for was that the price of gas which was general throughout Huddersfield, and which was obtained for Lindley in 1875, might also be made applicable to Longwood.

Mr. RAM: If the Company say, "This will damage us," then we say in our petition, as an alternative, and we say to-day through our evidence, "If you do not like to be tied down to give the lower price to Longwood, we are prepared to buy Longwood out from you on fair terms?"

Witness: Yes; that is the alternative.

Has such a proposal ever been refused by Parliament?—A similar case has never been before Parliament, to my knowledge.

Mr. *F. C. Lloyd*, the Town Clerk of Huddersfield, was called and produced a resolution which had been passed by the Longwood Committee in favour of the petition of the Huddersfield Corporation. He explained that though Longwood was a part of Huddersfield for certain purposes, the Committee was the local authority for other purposes, as Longwood had control over its streets, &c.

This concluded the evidence.

Mr. RAM intimated that he would at once address their Lordships.

The CHAIRMAN remarked that it might shorten matters if he stated that the Committee had decided against the purchase by the Corporation of the portion of the Longwood gas undertaking concerned.

Mr. RAM said that, owing to to the ruling of their Lordships, he would confine his remarks to opposing the preamble of the Bill. As far back as 1875, Longwood was cautioned by Huddersfield that, if they became part of the municipal borough, the powers now sought would be asked for. Coming to the evidence, he said the promoters were seeking for something unique—to buy up a competitor. They admitted that they were anxious to do it. If this were so, it was for Huddersfield to come before the Committee to say that since 1875 the promoters had had notice that when Longwood became part of Huddersfield the Company should allow Longwood the same rates that were charged in Lindley. The promoters had shown that they were making an advantageous bargain, and although they would lose something by Longwood being taken from them, they would not be poorer, but richer by their purchase of a rival interest, to which the Corporation did not object.

The CHAIRMAN remarked that, granting that Huddersfield were not stopped from making their present application, the Committee would like to know why the application was not made at the time when Longwood was attached to the borough.

Mr. RAM: We could not do it.

Mr. BALFOUR BROWNE: Why not?

Mr. RAM replied that it was only when the Gas Company came to Parliament that they could be heard, unless the Corporation were prepared to bring in a Bill. The promoters had admitted that while they would gain £350 a year on their bargain with their rivals, they would lose only £270 a year if Longwood were taken from them. Why should the promoters ask to be allowed to keep Longwood fettered as it had been for so many years unless the taking away of a part of Longwood would mean an irreparable loss to the Company? He contended that now was the time when Longwood, in all justice, ought to be treated the same as Lindley. As to the discount, it was proposed that, if Longwood was retained, there should be a standard price fixed; and Mr. Woodall had stated that, as long as the discounts were allowed, the price was not unfair. So that the Company were asking the Committee to retain Longwood in their grasp for another term of years, when, according to their own evidence, unless these discounts were stereotyped, there must be an injustice, owing to the excessive prices charged. Therefore, if the Committee refused the Huddersfield petition, not only would the small consumers in Longwood pay more for their gas, but they would be subject to have a greater impost put upon them if these discounts were altered. The promoters were asking for a standard price of 3s. 2d., whereas Huddersfield said it ought to be 2s. 8d. They were now seeking that which they intimated as far back as 1875 would be asked for, and he ventured to think that justice demanded it. He asked the Committee to say that Huddersfield was justified in bringing the petition before Parliament.

Mr. BALFOUR BROWNE, replying on behalf of the promoters, said at the outset that he disagreed with Mr. Woodall. That gentleman did not say that the Corporation of Huddersfield were stopped from making this application. In one sense that was true; but if a sense of justice and right ought to have estopped them, he thought they should have been estopped. In 1875, the promoters were seeking to alter their position, and to become a statutory Company, which would oust the Corporation, in whose district the Company were, from a concurrent right to supply gas. This was entirely different from the present position, as the Company were then endeavouring to alter their status. Huddersfield were trying to justify themselves in evading a solemn agreement. On broad principles, he would ask the Committee if it was not right that the people in the district of Longwood—whether it was in Huddersfield or not—should pay to the Company for their gas a fair price, giving a fair profit. Why should the Committee be asked to say that the people in Longwood should have their gas at the Huddersfield price? What would be the result? It might benefit the

consumers in Longwood, but it would be detrimental to consumers in Golcar. Was that fair? Was it the right thing for a big Corporation to do? They bound themselves twelve years ago not to do this very thing; and if there had been an anomaly to be removed, the right time for this to have been done was when they were taking in Longwood. It was not a fact that Huddersfield could not bring in a Bill for the purpose, as they had had several Bills before Parliament since that time. They did not bring in a Bill because they were of opinion that it was not a fair thing to do. This was an attempt on the part of the Corporation to break a solemn parliamentary bargain, which had been acted upon for twelve years. As to the discounts, the Committee knew that at the present time the Company were under no obligation to give them. They did it for their own purposes, and these would continue in the future as in the past. The object of allowing discounts was to bring the money in, and by granting a discount for prompt settlement people came of their own accord to pay. There had been no suggestion that the practice would not continue. The matter was voluntary to-day, and it should be voluntary hereafter.

The CHAIRMAN: You would not be willing to make it imperative?

Mr. BALFOUR BROWNE said they would rather not. He had no doubt the Directors would tell the Committee that they had no intention of doing away with the discount system.

The CHAIRMAN asked if they would be willing to have this incorporated in the Bill.

Mr. BALFOUR BROWNE said he would rather not have it stereotyped; but he did not say he would not take the Bill if the condition were imposed. He hoped the Committee would conclude that, as the Company had complied with the suggestion without compulsion in the past, they would continue to do it. The matter between the promoters and the Huddersfield Corporation was one of good faith, and if any regard were to be had to honour and decency, the Corporation were estopped—not from applying to Parliament, because anybody could do that, but out of propriety; and he hoped the Committee would refuse their request.

The Commitee having consulted a short time,

The CHAIRMAN said: The Committee find the preamble of the Bill proved; but they are of opinion that a clause should be inserted putting some limit on the discount. The Company have already expressed their intention not to alter the system; but that is a very different thing from having a statutory limit, and the parties are entitled to some security.

Mr. BALFOUR BROWNE: We will bring up a clause dealing with discount for prompt payment. Of course, it is a limit downwards—that we are not to allow less than a certain amount?

The CHAIRMAN assented.

A clause was afterwards added to the Bill providing that if discounts are allowed they shall not be less than 5 nor more than 20 per cent.

HARROGATE AND THE KNARESBOROUGH WATER SUPPLY.

The Bill promoted by the Knaresborough Urban District Council to enable them, among other things, to improve the gas and water supply of the town, has lately been before a Committee of the House of Commons presided over by Mr. Charles Bell. The powers sought in connection with the gas undertaking were generally extensions of those now possessed by the Council; and they did not encounter opposition of a serious character. With regard to the water supply, it appears that after the framing of the Bill an arrangement was entered into with the Corporation of Harrogate to supply Knaresborough with water—the Corporation to obtain a Bill for the purpose next year. In the event of the Bill passing, the water provisions of the present measure would be useless. But there was a probability that Harrogate would not get its Bill, in which case the clauses in the Knaresborough Bill would stand. If, on the other hand, Harrogate was successful, the clauses could be taken over and embodied in the Harrogate measure. Provision was made for the continuance of the present water supply pending the decision as to the supply of water by Harrogate, by the insertion in the Bill of the following clause:—

The Council may maintain, renew, extend, and repair the reservoirs, mains, pipes, and other water-works for the time being belonging to them, and may use and employ the same for the purpose of taking, intercepting, and impounding any water that can be thereby taken, intercepted, or impounded, and may take any water which might have been intercepted or impounded by them if this Act had not been passed, and may sell and supply water in accordance with the provisions of this Act.

Clause 20, which would precede the foregoing, was amended to read as follows:—

The limits of supply of the Council for the purposes of water supply shall be the urban district of Knaresborough, and the parish of Scriven, and so much of the parish of Knaresborough Outer as is not within the limits of supply of the Harrogate Corporation.

The Bill passed successfully through Committee.

Consolidated Water-Works Company of Rosario, Limited.—The seventh ordinary general meeting was held at the London offices of the Company last Tuesday. Mr. R. J. Neild presided, and moved the adoption of the report. He said the undertaking was making slow and steady progress. This was especially satisfactory when the position of affairs, both economic and commercial, which had prevailed in Argentina during the period under review was considered. The City of Rosario was the outlet primarily for the province of Santa Fé, which had experienced the commercial depression more than any other part of the Republic. In spite of this, and notwithstanding very considerable and constantly-recurring difficulties with the local authorities, the Company had not only held their own, but had made substantial advance. The concern was now probably stronger, and rested on better and broader foundations, than it had ever previously done. Mr. F. S. Isaac seconded the motion, which was adopted; and a dividend of 4 per cent. on the ordinary shares was declared.

JOINT PARLIAMENTARY COMMITTEE ON THE LONDON WATER BILL.

Second Day—Tuesday, April 22.

(*Lord* BALFOUR OF BURLEIGH, *Chairman, the Earl of* CREWE, *Viscount* LLANDAFF, *Lord* LUDLOW, *Lord* DE MAULEY, *Sir* WILLIAM ARROL, *Sir* WILLIAM HOULDSWORTH, *Sir* JAMES KITSON, *Sir* EDGAR VINCENT *and Mr.* M'CRAE.)

The Hon. J. D. FITZGERALD, K.C., Mr. RAM, K.C., Mr. RICKARDS, Mr. SQUAREY, Mr. HONORATUS LLOYD, and Mr. F. F. LIDDELL appeared for the promoters—the Local Government Board. Mr. BALFOUR BROWNE, K.C., and Mr. FREEMAN, K.C., appeared for the London County Council, and, with Mr. MOON, K.C., and Mr. CLODE, for the Railway Companies; Sir EDWARD CLARKE, K.C., Mr. CLAUDE BAGGALLAY, and Mr. F. W. PEMBER appeared for the New River Company; Mr. DANCKWERTS, K.C., and Mr. MOON, K.C., for the Chelsea Company; Mr. LITTLER, K.C., and Mr. LEWIS COWARD, for the Kent Company; Mr. PEMBER, K.C., and Mr. BAGGALLAY, with Mr. TALBOT and Mr. GULLY, for the East London Company, with Mr. BELLEWES for the Grand Junction and West Middlesex Companies, with Mr. DU CANE for the Southwark and Vauxhall Company, and for the Lambeth Company; Mr. HUTCHINSON for the Lea Conservancy; and Lord ROBERT CECIL for Hertfordshire. There were also many other appearances.

At the commencement of the proceedings to-day,

Mr. PEMBER, on behalf of four of the Metropolitan Water Companies, said he was instructed to say that they were unwilling to part with the possession of their undertakings. If Parliament, however, decided that they should be compulsorily transferred to a public body, they would loyally accept and bow to such decision; but they were vitally interested to see that the terms of compensation were fair and reasonable.

Mr. *Charles Perrin*, the Official Water Examiner for the Metropolis, in answer to Mr. RICKARDS, described the limits of supply of the various Companies. He also produced tables showing the populations and the rateable and assessable values of the districts in the area of Water London, in the county of London, and within the counties of Middlesex and Kent.

In cross-examination by Mr. LEWIS COWARD (representing the Kent Company), witness said he was not aware that the Kent Company stood on a footing somewhat different from the other Metropolitan Companies, in that it had an area of some 177 square miles, and there were only 30 square miles within the area of the county of London.

Mr. COWARD: None of the supply is taken from the Thames?

Witness: That is so.

The whole of it is taken from the chalk of the district?—Yes.

There has never been any complaint either against the quality of the water or the quantity?—I have heard of none.

Witness was not cross-examined by the representatives of the other Companies.

Mr. RICKARDS (for the promoters, the Local Government Board) said this was all the evidence they proposed to call at that stage. When they came to financial considerations, it might be necessary to bring up a witness; but they could not do so at present.

The CHAIRMAN: We want some information with regard to the financial provisions.

Mr. RICKARDS said, after that intimation, a witness would be called—viz., Mr. F. G. Banbury, a Trustee and Manager of the Stock Exchange; but he would not be ready to give evidence till two o'clock. The question as to the transfer on the appointed day might be taken first. The Local Government Board considered this a question rather of argument than of evidence, and therefore they did not propose to call a witness upon it.

Sir EDWARD CLARKE (for the New River Company) said it was a very singular course which was being taken, in not calling evidence. He was not aware of any report of a Royal Commission or Committee which sustained the proposal of the Bill with regard to transfer on an appointed day; and the Companies were placed in a very difficult position. Before the Bill was submitted to Parliament somebody must have considered the question; and that person ought to give evidence, in order that his reasons might be examined and challenged.

The CHAIRMAN said he did not feel inclined at this stage to interfere with the discretion of the Local Government Board in the matter.

Mr. RICKARDS gave, as precedents for the proposed appointed day, the Metropolitan Board of Works (Various Powers) Bill of 1884 for the acquisition of Hackney Common, when the common was transferred to the Board as from the date of the passing of the Act; and also Electric Lighting Provisional Orders and Light Railway Orders, where provision was made for the transfer of an undertaking to the local authority within a certain period. He said it would obviously militate against the unification of the Companies' undertakings to postpone the transfer for probably a very long period, as would be the case if no day were appointed.

After some further discussion,

Mr. FITZGERALD (who also appeared for the promoters) said the advantages of not delaying unification were obvious. The date fixed in the Bill gave twelve months from June 24, 1903—that was, eighteen months from the passing of the Bill, if it did pass. If the Companies put forward evidence to prove that that date did not show a sufficiently wise discretion on the part of the Local Government Board, he must meet the argument as best he could; but, in the absence of any evidence to that effect, he should submit with a certain amount of confidence that the period was a sufficient one.

Mr. PEMBER said that was simply shifting the *onus probandi* from the promoters, who ought to bear it, to the opponents.

Mr. COWARD said he should be glad to hear the names of the Light Railway Orders on which the promoters relied.

Mr. FITZGERALD said the question of arbitration had been before the Companies for the last seven years—since the London County Council introduced their Bill in 1895; and it was almost inconceivable that they had not now in their possession the necessary facts to lay before

an Arbitrator. Unless the Companies could show an injustice would thereby be done to them, he submitted that the transfer on the appointed day should take place. He did not see how the Local Government Board could be expected to give evidence on a point of that kind.

The CHAIRMAN said that if no evidence were called, the promoters would not be entitled to call rebutting evidence against that brought forward by the Companies. He asked if the latter would produce their evidence at that stage in order not to waste the time of the Committee between then and two o'clock.

Mr. PEMBER thought the financial evidence, which impinged on the question of the appointed day, should be given first. He also asked the Committee to decide that the Companies' petitions should be heard last, to which they were entitled.

The Committee then adjourned till two o'clock. On re-assembling,

The CHAIRMAN said the Committee agreed to Mr. Pember's submission that the petitions of the Companies should be taken last.

Mr. LITTLER urged that evidence should be called upon the appointed day question by the promoters.

Mr. FREEMAN (for the London County Council) asked if the promoters intended to take the same course—of calling no evidence—upon other parts of the Bill.

The room was cleared; and on the public being re-admitted,

The CHAIRMAN said: With regard to this part of the Bill, the Committee do not desire to put any further pressure on the Local Government Board to produce witnesses. They are satisfied with the position. As to the point raised by Mr. Freeman, it will probably be convenient that, on the assembly of the Committee on Thursday, the Local Government Board should indicate to their opponents the course they propose to take as regards the constitution of the Board.

At this stage, Mr. FITZGERALD asked, and obtained, permission to call one witness as to the appointed day.

Mr. *John Lithiby*, the Assistant-Secretary to the Local Government Board, was then called and examined by Mr. RICKARDS. Witness said the question had been carefully considered by the Department; and advice had been given to the President of the Board by Sir S. B. Provis, Permanent Secretary, and by the Assistant-Secretaries. The Board had come to the conclusion that it was to the interest of the water consumers of the Metropolis to fix a day for the transfer, and that this was in no way detrimental to the interests of the shareholders in the Companies. The arbitrations would take a considerable time; and if no day were fixed, they would probably take longer. In the second place, it was possible that, when once the Companies knew their undertakings would be transferred, their interest in the management for the benefit of the consumers would not be so keen. In saying this, he made no suggestion as to a desire on the part of any Company to detract from its duty in regard to the supply of water to London. Thirdly, it was necessary, in the management of the undertakings, to look well ahead, so as to see what works might have to be carried out, and what money expended, in order to provide for the continuously growing population of the Metropolitan area. Fourthly, it was not unreasonable to suppose that the Companies' attention during the proceedings connected with the arbitrations would be directed towards the sale of their undertakings rather than to providing for the future, when those undertakings would have passed from their control to that of a public authority. It would probably take some years to complete arrangements for transfer. It was submitted that serious detriment to the water consumers of London might arise during that time unless there were some authority exercising adequate control; and the only body who could do this was the Water Board.

Mr. RICKARDS: Do the Board consider twelve months after June 24, 1903, gives sufficient time to the Companies?

Witness: So far as they have been able to form any opinion, they do.

In cross-examination by Mr. PEMBER, witness said he had had no experience in the actual management of a water company, but had read the reports of the Water Examiner, and those of the various Royal Commissions. He presumed the Water Companies were like ordinary individuals. If their Directors were engaged in preparing cases to be submitted to arbitration, their attention would not be so keenly given to carrying out the duty of supplying water to London. It was true the Water Board would have eight cases to prepare, as against each Company only having one; but their numbers would allow them to deal satisfactorily with all the matters needing their attention.

Mr. PEMBER: I assume the Water Board will take over the officers of the Company—the Engineers, for instance. On which side are they to give evidence then—for the Company or the Board?

Witness: The Local Government Board cannot have any knowledge of what will happen two years hence.

On which side would they give evidence?—I am not prepared to say.

Who is to have their services?—I must refer you to the Bill.

In further cross-examination by Mr. BAGGALLAY, witness said there was nothing in the reports of the Royal Commission on the special points under discussion; but Bills had been promoted by the London County Council from time to time, which contained a provision analogous to it.

Mr. BAGGALLAY: Is that the sole ground upon which you suggest there should be a given day, and a departure from the ordinary practice with regard to the transfer of a gas or water undertaking to a local authority?

Witness: This is a very exceptional matter. You have one enormous area supplied by eight different Companies, who are considerably bound up in each other's interests. No such case has hitherto come before Parliament. Exceptional circumstances demand exceptional conditions.

Dozens of cases have come before the Local Government Board of Bills promoted by local authorities for the acquisition of gas or water undertakings, or both. Do you know any instance in which it has been proposed that there should be an appointed day for the transfer, apart from whether the arbitration to ascertain the price has taken place or not?—I do not think so.

Have the Local Government Board ever made a report to any Committee of Parliament, particularly the Police and Sanitary Committee, recommending that, with a view to prevent companies from not having an inducement to maintain their undertakings, or to prevent them from delaying the arbitration, there should be a transfer before arbitration?—There would be no reason for their doing so, because there has never been a case like this.

Does not the same principle apply here?—No; decidedly not.

In re-examination by Mr. FITZGERALD, witness said that the Companies were represented before the Royal Commissions not only by their own officers, but by eminent Engineers, whom they retained. These gentlemen would not pass to the Water Board, and could give evidence before the Arbitrators.

Mr. *F. G. Banbury*, M.P., a Trustee and Manager of the London Stock Exchange, in answer to Mr. FITZGERALD, said he had examined the financial proposals of the Bill, so far as they related to the mode of payment for the undertakings by means of water stock, to the purchase of redeemable and irredeemable debentures, and also the formation of a sinking fund. It was of very great importance that the Water Board should be in a position to pay the consideration in water stock. If payment were made in cash, the money would have to be raised by the issue of water stock at a lower price than that existing in the market. One could form an opinion of that by noticing what the Government had done this week. Consols last Monday stood at 95. When the Government issued the new loan, they fixed the price at 93½, with 12s. 6d. discount, which reduced it to 92⅝. Therefore, in the case of Consols, it was evident the Government considered it necessary to issue it about 2 per cent. below the market price. In the case of stock like the present, the difference would have to be larger, as there was not so much speculation in it, neither was it an international stock.

Mr. FITZGERALD: Assuming that at the time of issue the London County Council stock stood at 99, at what figure would you think it would be necessary to issue water stock?

Witness: I should think about 4 or 5 per cent. lower.

If it were issued in blocks of £4,000,000 or £5,000,000, would it be an advantage?—I do not see that there would be much advantage to be gained by that, because the investing public and the market would know that eventually £30,000,000 or £40,000,000 would have to be issued, and would not be so anxious to have the first instalment.

In answer to further questions, witness said he presumed the arbitrators would fix the amount of water stock to be awarded to the shareholders, in order to give them the value of their undertaking, upon the price at which the stock was issued in the market. It did not in the least follow that, if the proposals of the Bill were carried out, there would be any depression in price in the market. Many of the shareholders would elect to keep the new stock; and therefore there would be no fear of any large quantity being thrown upon the market. It would find its proper value, and those who wished to sell would be able to do so. The larger the stock the better the market.

In reply to Mr. FREEMAN (for the London County Council), witness gave an example of the advantage derived by a water debenture holder by the proposed arrangement. The New River 3 per cent. debenture stock stood at about 97½; the 3 per cent. stock of the London County Council (which afforded a fair criterion of what the new Water Board 3 per cent. stock would be) stood at 98½. The difference between the 97½ and the 98½ would be the advantage which the water debenture holder would gain by 3 per cent. Water Board stock being substituted for his present stock. It was put to witness by Mr. Freeman (whose object was to show that too great an advantage would be gained by the shareholders by their being paid in stock in the way proposed by the Bill) that the London County Council's 3 per cent. stock stood at 100⅞, and the consolidated stock at 101¾, on Dec. 31 last; but he said he thought that must be a mistake—it was only 98½ at the present time. The payment in stock instead of in cash saved the ratepayers the outlay on issuing stock, which was an expensive thing. If he had to make the awards, he should wait until the whole of the arbitrations had been heard.

In answer to Mr. BAGGALLAY, witness said that payment would have to be made wholly in cash or wholly in stock; he did not think it could be divided. Asked whether he did not think it fair that a stockholder should have the option of taking cash rather than be forced to take stock, which he might or might not wish to have, witness replied that the stockholder was not injured in any way.

Third Day—Thursday, April 24.

On the resumption of the proceedings to-day,

Mr. RICKARDS said the question of calling further evidence with regard to the transfer on the appointed day had been considered, and it had been decided to call Mr. Mansergh.

Mr. *James Mansergh*, F.R.S., examined by Mr. RICKARDS, said he had frequently assisted the Companies in their parliamentary proceedings. He had every desire that they should be fairly compensated for the transfer of their undertakings.

Mr. RICKARDS: I will take you at once to the proposal for the transfer on an appointed day. Have you considered the desirability of that being done?

Witness: Yes. The real justification for an early vesting day is the manifest desirability of putting to an end the working of eight distinct and independent bodies, and the substitution for them of one authority having control of the whole water supply of London. Hitherto each Company has necessarily and quite properly been working for its own hand; and this has undoubtedly led to the premature spending of money which might have been avoided if the whole business had been under one management. This point is patent to everybody, and is clearly set out in the report of Lord Llandaff's Commission. I feel very strongly that it is desirable this reform should be brought about at the very earliest possible moment; and I think it can be done without in any way prejudicing the Companies. I entirely concur with the report of Lord Llandaff's Commission, which states that the unification of the water supply is in the interests of the water consumers of London.

In answer to further questions, witness stated that up to the close of the appointed day all the officials and servants of the Companies would be doing their respective duties; and on the following day they would go on just as before—the only difference being that they would have different paymasters. The time allowed before the vesting day was not required for the Companies to get up their cases for arbitration. The only figure they wanted was the amount of the profit

income on the appointed day, which they would get from their books. The Companies might also claim for excess works, and that they had power from Parliament to take more water than was required to earn the income on that day. The Engineers would know the capabilities and the conditions of all the works.

Mr. RICKARDS: The Companies would in these respects differ from one another?

Witness: Yes.

In some cases the income would not be maintainable for so many years as in others?—That is so.

Witness went on to say, as to the point that there was no precedent for such procedure, that the case was unprecedented altogether. With regard to the principal officers passing under the control of the Water Board, this was, in his opinion, a sentimental objection. He thought tney should act as witnesses or prompters for the Companies in the arbitrations, without being fettered in any way by the fact of the change in their position. When it came to questions of opinion as to value, if their evidence were to be put in at all, it should be as witnesses for the Companies.

In cross-examination by Sir EDWARD CLARKE (for the New River and East London Companies), witness said the appointed day should be as early as possible, having regard to fairness to the Water Companies. He thought it should be the same day for every Company; but he did not press that. With regard to the New River, East London, and Kent Companies, who made their annual accounts up to the 31st of December, the vesting day might be on the 1st of January.

Sir EDWARD CLARKE: Do you not think it is extremely unjust that persons called as witnesses on behalf of the Companies should also be interested on behalf of the purchaser?

Witness: I do not think it would make the slightest difference.

In cross-examination by Mr. BALFOUR BROWNE (for the London County Council), witness said he did not know who was to give evidence for the Water Board if the Engineers were to give evidence for the Companies.

Mr. BALFOUR BROWNE: That is a nice state of affairs for the Board. All the gentlemen who know everything about these concerns are to give evidence for the Companies?

Witness: Yes. If I ever have a debatable point before me, I always, if I can, give the benefit to the seller.

Have you ever had to deal with an Act which said that you were to transfer an undertaking on such terms as you thought most just and fit? Is not the usual phrase either that you are to give fair and reasonable compensation or full compensation?—I dare say the phraseology is different; but I do not know.

Mr. MOON (cross examining for the Chelsea Company): Three or four years may elapse after the transfer on the appointed day before the last of the Companies is purchased?

Witness: Yes.

The Arbitrator will have before him the results of the revenues and profits during those years?—Yes.

It would therefore be to the interest of the officials of the Water Board to make the surplus revenue as small as possible?—I should not like to admit that. I do not think it would be to the interest of anybody to do anything wrong.

In re-examination by Mr. FITZGERALD, witness said that in a large number of transfers there was a provision inserted in the Act that the officers of the gas or water company were to be taken over by the local authority after the transfer.

Mr. FITZGERALD: Has that made any difference to the evidence they have given, so far as you know?

Witness: I do not remember any case; but I think it is more frequent that the officers do not give any evidence at all—the case for the selling company being put before the arbitrator entirely by witnesses called in from outside.

By Lord LLANDAFF: The Engineers would have to give evidence of the plant being in good working condition.

Lord LLANDAFF: It is the value of the thing to be sold and bought on the appointed day that has to be found; and if the revenue has been altered since, that has nothing to do with the purchaser?

Witness: I think that is so.

Mr. BALFOUR BROWNE: May I say, in answer to that, that it has been decided in the King's Bench Division that a rise in the price of coal after notice to treat was admissible evidence as to compensation in an arbitration? I am not sure, however, that that is right. I believe it is now under appeal.

This concluded the case on this part of the Bill for the promoters; and evidence on behalf of the County Council was proceeded with.

Mr. *H. E. Haward*, the Comptroller to the Council, examined by Mr. BALFOUR BROWNE, said the financial proposals of the Bill were matters of the utmost importance to the public, and were open to serious objection. The most satisfactory method of payment was in cash, with the option to the vendor to take stock by agreement. This was the recommendation of Lord Llandaff's Commission, upon which sat two members who had special financial experience. Mr. Banbury had not advanced any other suggestions for the proposed arrangement under the Bill than those he made before Lord Llandaff's Commission; and they had been pretty well criticized by the two members he had referred to. Payment in stock involved two valuations: First, of the undertaking; and, secondly, of the stock. In regard to raising the cash in the market, first of all the debenture and mortgage debt might be left out of consideration, because, under the Bill, a different method of dealing with this debt was proposed. The amount of this on the 31st of December was about £10,000,000. Many of the shareholders would, no doubt, agree with the purchasing body to take stock, at a fair and reasonable figure to be agreed upon; so that the amount of cash to be raised in order to pay those shareholders who declined to take stock would be reduced to a more manageable figure. The whole would not have to be raised in one day. Mr. Banbury had suggested that the Stock Market would know that large sums would have to be raised in the course of a few months, and that the effect would be very much the same as an immediate issue of the total stock. But there were two ways of dealing with that matter. The Water Board might issue and advertise a large loan, spreading the instalments perhaps over a year, as the Chancellor of the Exchequer had recently done; or they might decide to make the loan in two issues. A great deal would depend upon the state of the market at the time, as to which method was considered the better. The stock would not really be an additional demand upon the market for money, because the existing stocks of the Companies would be extinguished.

Mr. BALFOUR BROWNE: The new stock would merely take the place of the old water stock?

Witness: Yes.

Continuing, witness said it was true the money would have to be raised first of all, and paid to the shareholders, before it could be re-invested; but the fact that such demand would arise for gilt-edged securities on the part of the shareholders could not fail to be taken into account by the Stock Exchange. It would make them all the more ready to take the stock from the Water Board, so as to make a small profit on it.

Mr. BALFOUR BROWNE: Would the operation be something like the conversion of stock?

Witness: Yes; I think it would.

It would be different from the raising of the loan of £32,000,000 by the Chancellor of the Exchequer the other day, which did not replace anything, but was raised without any asset being on the other side?—Certainly. When one considers the comparative ease with which the Chancellor has been able to raise £122,000,000 during the last two years by means of Consols and loans, apart from Local Loan Stock and Exchequer Bonds, one can hardly conceive there will be any insuperable difficulty in raising such a loan as would be required to pay the shareholders of the Water Companies in cash.

Do you agree that the cash would have to be issued at between 4 and 5 per cent. below the market value?—To expect 4 or 5 per cent. on a transaction of this kind seems to me to be an extravagant suggestion. Mr. Banbury said that the Chancellor of the Exchequer had to issue at 2 per cent. below market value. I have been looking at the price of Consols just before the last loan was issued, and I cannot agree with Mr. Banbury. He took them at 95. I could only find one or two transactions on one day at 95. Certainly no seller could have realized 95 for Consols. We must also remember that there were rather extravagant hopes based upon the rumours of peace; and therefore there was a good deal of speculation in Consols. It is rather difficult to say what their value really was. But I do not think it can be said the Chancellor raised at more than 1½ per cent. below the market price; and I doubt very much whether he would admit that. Mr. Banbury said the difference would be still greater in the case of the Water Board. The experience of the London County Council is that if the Stock Exchange can see a profit of 1 per cent., or even less, on the issue of stock, there is a great rush for it. Our last loan in January for over £3,000,000 was subscribed for nine times over in twenty-four hours; and the premium never rose to 1 per cent., but kept to about ½ per cent. As to commissions, we pay ⅛ per cent. to brokers. We pay no other commission; and the stock is not underwritten.

The shareholders would, of course, be quite willing to get their payment in stock, backed by the rates?—Certainly.

In answer to further questions, witness said that if the recommendation of Lord Llandaff's Commission was gone against, it would be advisable to instruct the Arbitrators to first of all find the capital value of each of the undertakings, and then the amount of water stock equivalent to such value. This was not provided for by the Bill. He thought the Water Board stock could be made even better than the County Council stock, because there was a larger rateable area, and there would be the water security as well. The public of London would not be satisfied with any bargain come to with the Companies unless assured that the investigation made as to the value was conducted in the most exhaustive way by competent people. There was no provision in the Bill for financial machinery, and it was necessary to lay down rules with regard to the appointment of Finance Committees, control of expenditure, and submission of estimates, &c.—such as were found necessary in the case of county councils and other local authorities.

In cross-examination by Mr. FITZGERALD, witness said that the drift of his evidence was that, by payment in stock instead of in cash, the Water Companies might get too favourable terms, and that payment in cash was quite practicable. The redeemable debenture holders would be taken over by the Board, and left in exactly the same position as at present. If his view were correct—that the water stock would be more valuable than the redeemable debentures—this was a matter which the Arbitrators would take into account. But the Bill gave them a better security—viz., that of the public rates. They had, however, an excellent security at present in most of the Companies. If the shareholders were paid money, the Arbitrators must take into account the fact that some time must elapse before they could re-invest it, and also the cost of the investment.

Mr. FREEMAN intimated that this was all the evidence the County Council would call on this part of the Bill.

Mr. PEMBER, on behalf of four of the Water Companies, then addressed the Committee with regard to the appointed day, contending that it was most unfair, and that the evidence in its favour was not sufficient to justify so serious a departure from English law. The universal practice in all cases of compulsory purchase was to adopt the provisions of the Lands Clauses Act. It was not a serious matter for the purchaser if the purchase were delayed three or four years.

Sir EDWARD CLARKE also addressed further arguments to the Committee on the point; and, at the conclusion of his remarks urged that they should decide the matter before proceeding further.

The CHAIRMAN, after consulting the members of the Committee, said that they would take the main points on that part of the Bill before deciding any one, however important.

Mr. *George H. Hill* was called on behalf of the Companies. He said he saw no difference in principle between the present case and other cases of transfer, in none of which had the proposal been made to vest the undertaking in the local authority before purchase.

Fourth Day—Friday, April 25.

On the opening of the proceedings to-day, Mr. *G. H. Hill* was further examined.

Mr. BAGGALLAY: It is provided in the Bill that, for the purpose of

enabling the Companies to conduct their cases for arbitration and enter into agreements with the Water Board, any Company may, after the appointed day, temporarily retain for their own use such money, officers, books, &c., as may be agreed upon between the Board and the Company, or, failing agreement, to be determined by the Local Government Board. Does that clause produce any sufficient mitigation of the effects of the transfer on an appointed day to the purchasing authority of all the officers, &c.?

Witness: In my opinion, it does not. I think the books and accounts and all the documents and the officers themselves should remain with the Company. Theoretically, it may appear that a man may be able to serve two masters; but I am sure it cannot be carried out effectually or both sides.

Continuing, witness said it would be putting the Company in an unfair position to make them part with their officers, and so on, before the arbitration took place. Mr. Mansergh had said that the Companies would be allowed to retain them, although technically they were transferred; but this would depend very much upon the accident of who controlled the proceedings of the Water Board. The Bill further provided that the Board might abolish the office of any existing officer, in which case compensation was to be made. It would be very objectionable to place an officer, while still having to serve the Company as was suggested, in the position of being under a master who might dismiss him and abolish his office. It would be better to follow the usual practice, and let all the Companies retain their officers and works, and so forth—until the arbitration had been concluded, at all events. It would be far preferable to follow the beaten track, which had proved successful, than to enter into a new procedure which had yet to be tried. It had been suggested that, unless a day were appointed for the transfer, it might be to the interest of a Company to delay the proceedings of the arbitration, and also not to properly maintain their works; but he could not see that they would have such an interest. On the contrary, the officers would have an interest in keeping the works in first-class order, so that the value might be fixed according to the property to be purchased. Even if the day on which the value was to be ascertained should be before the actual transfer, the Company would be interested in maintaining the undertaking pending the arbitration, as the officers would ultimately become the officers of the Water Board. A notice to treat, or a date equivalent to a notice to treat, should be given by the Bill. That would prescribe, in effect, the date on which the value should be ascertained, in accordance with the usual practice. The same principles should apply to the present case as in other transfers. It should be under the Lands Clauses Act; and if any point ought to be excepted from that Act, it could be dealt with by way of exception.

In cross-examination by Mr FITZGERALD, witness said he had been first called in about six weeks ago. His objection was that the procedure of the Lands Clauses Act had not been followed. Under that procedure, two Arbitrators and an Umpire would be appointed; and there would be eight separate arbitrations at different times.

Mr. FITZGERALD: If a Company were dissatisfied with the amount settled by the Umpire, no other Company would ever agree to appoint him in the subsequent arbitrations?

Witness: I do not know that. I do not think the result of the first arbitration should be known, because it might affect the opinion of people connected with the other Companies. It is very easy for the experts to boil down how the results have been arrived at.

Your suggestion comes to this—that no undertaking should be transferred, and no award published, till the whole have been settled?—I think that is better. If there were one Court, it would have to sit continuously.

We are to wait till all the eight arbitrations are concluded before the Water Trust comes into power?—That would be better than the other arrangement.

Can you show me any provision in the Bill which will work hardship to any Water Company?—Well, it is new. We should have to learn that.

You cannot, with your fifty years' experience, find out any hardship?—No.

By Lord LLANDAFF: The power was in the hands of the Local Government Board under the Bill, and no one had any power to resist it. He did not like the arrangement.

Sir *Frederick Bramwell*, examined by Mr. DANCKWERTS, said he had given evidence before Lord Llandaff's Commission, which had recommended payment of compensation under the Lands Clauses Act. It was not practicable to devise any better procedure than under that Act. If a man were compelled to part with his property, he ought at least to have the whole of its possible value to him. Whether he should get something more for disturbance of investment was another point, which should be left to the Umpire. If there were no ground for it, he would not give it.

Mr. DANCKWERTS: If there is ground for it, and it is not given, it is confiscation?

Witness: Yes. Whether you take away my property or put me to expense in preserving it, it comes to the same thing.

You see the Bill contemplates giving certain directions to the Arbitrators, that there shall be no allowance for compulsory sale?—It would fetter an Arbitrator, and be a warning to beware of the Lands Clauses Act. I do not like directions being given to an Arbitrator at all, except those given by the usual statute under which he acts.

In reply to further questions, witness said the determination of the amount to be awarded to each Company would necessitate an arduous inquiry, and would take some time, During that period, the Company should be in possession of their books and assets, as was the universal practice. He could not see any occasion for unity of management in a hurry. Unity of management would be necessary in determining any great scheme to increase the water supply, but was not necessary to continue the present supply. He did not think there would be any consensus of opinion in the way of extension on the part of the Water Board for years to come; and as to whether they got possession in eighteen months or waited for a further eighteen months, could not make any possible difference to London with regard to its water supply. One point would be to consolidate into one the various provisions of the Acts of the Companies. This might probably result in uniformity of charge; but there was no pressing need for unity of management. The Companies should continue in power pending the arbitration, rather than by the grace and favour of the Local Government Board. He preferred not to take away a person's property to begin with. The proper thing was arbitration under the Lands Clauses Act—the price being ascertained, and the undertaking paid for, before transference. In the Stockton and Middlesbrough case, Parliament had laid it down that there should be an allowance for compulsory sale.

Cross-examined by Mr. FITZGERALD: You say there is no immediately pressing need for unification; you do not think there should be unification at all?

Witness: Parliament has decided that. I have nothing to say upon it. You are waving a red flag before me, which I am not going to take notice of.

It is the fact that that is your view?—It was. But I am loyal; and I bow to the decision of Parliament. I wish Parliament had not so decided.

The Stockton and Middlesbrough case was one of the early arbitrations, in 1878—the Act being in 1876; and in that case Parliament took the very unusual step of settling the basis of the arbitration, and inserted a number of special provisions?—Yes.

The general view was that the purchasers paid about half as much again as the undertaking was worth?—I do not know.

In the Birmingham gas transfer, the arbitration was under the Companies' Clauses Act?—Yes. Each side appointed an Arbitrator, and they appointed an Umpire.

Was any injustice done in that case?—I hope not. I was one of the Arbitrators.

Therefore the Lands Clauses Act is not essential for the purpose of getting at the full value of the undertaking?—No; if the Act in substance contains the same clauses, with provision to appoint two Arbitrators and an Umpire.

Is that the most important point on which you object to the provisions of the Bill?—No; the most important point is taking away my property before you have paid me for it.

Under the Bill, the Arbitrators are to award such an amount of stock as is, in their opinion, equivalent to the money value of the undertaking; and they are to estimate this as if, with the necessary modifications, the principles of the Lands Clauses Act were applicable. Cannot they award full compensation under that?—I presume so; but if they meant that, they would say it. I am alarmed at words of that kind, when there is such a simple expression which leaves it without doubt.

You object to the exclusion of allowance for compulsory sale?—Yes.

You have always been an advocate of the 10 per cent.?—No; I will not say that.

I think I heard you say, in the Devonport case, that the Company ought to get 10 per cent.?—I do not think you did; I do not think I gave particular figures. But to go back to the Stockton and Middlesbrough case, where Parliament said there should be some allowance, in those days I said 10 per cent., because I had never heard of anything else.

Parliament has never said so since?—Not to my knowledge.

Mr. *Charles Hawksley*, examined by Mr. RIGG, gave similar evidence to that of the last witness. The date of the notice to treat fixed the time at which the value of the concern was to be taken; and nothing that the Company could do after that would add in any way to its value. Any inquiry into the condition of the undertaking—such as mains, reservoirs, pumps, boilers, and so on—must be made after the serving of the notice to treat. Therefore it could not possibly be to the interest of the directors or officials to let their undertaking down after the notice. The accounts of the Companies were audited every year by the Government Auditor, who issued a very elaborate report. The purchaser could at once see the revenue, and how it was arrived at, the rate of expenditure, and everything connected with it. If further information were required and refused by the Companies, an order to furnish it could be obtained from the Arbitrator; but he had never known such a difficulty arise.

Cross-examined by Mr. FITZGERALD: Like Sir Frederick Bramwell, you have been an opponent of the transfer of undertakings to public bodies?

Witness: I have; and I still hold the opinion that it is to the interest of the public that they should remain in the hands of the companies. But Parliament has decided that matter.

Can you point out any provision in the Bill which would prevent the Arbitrators awarding the full value of the undertaking?—First of all, the Court is a special one.

That will not prevent them awarding full value?—I will not express an opinion upon that point. Then the new regulations, in lieu of the Lands Clauses Act, will interfere with free action of the Arbitrators. In clause 18, they are instructed not to make any allowance for compulsory sale, and are not to take into account any enhancement or depreciation of the market value of any stock or shares of the Company which, in the opinion of the Court, is caused by, or has resulted from, the passing or the anticipation of the passing of the Act.

You will agree that no Arbitrator ought to take into account any enhancement of the market value caused by the Act?—Yes; but they do not require an express instruction to that effect. They ought not to take into account the market value of the shares at all, whether enhanced or depreciated. It is wrong to do it.

In re-examination by Mr. BAGGALLAY, witness said the Bill ought to so provide that the person whose property was expropriated was sure to get compensation. He understood the wording in clause 18, subclause 9, which directed the Arbitrators not to have regard to certain market values, to mean that they were to have regard to certain other market values. This was the impression it would give him if he were acting as Arbitrator.

Lord LLANDAFF: When are the Arbitrators to begin under the Bill as it stands?

Witness: I do not know.

Mr. FITZGERALD: The Court of Arbitration will appoint the day.

Lord LLANDAFF: But who is to set them in motion? There is no notice to treat.

Mr. FITZGERALD: In many of these arbitrations, there is no notice to treat. The matter is referred to arbitration by the Bill. Either party may apply.

Mr. *Edward M. Eaton* gave corroborative evidence to that of the last witness for the Companies. He said that some years must elapse before the Water Board could alter the existing systems of supply in any way. He would give an allowance for compulsory sale, for loss and disturbance of investment, and the usual contingencies arising out of a transfer.

In cross-examination, witness admitted that if water stock were substituted for the existing stock, there would be nothing of that kind to compensate for. He was aware that the Court might make any allowance for expenses that they thought fit.

Mr. *Henry Rofe* also gave similar evidence. He said he would not accept the responsibility of acting as Arbitrator under the provisions of the Bill, and did not think any sane man would do so. The Water Board might contain elements hostile to the Companies; and the whole of the working out of the arrangement by which the Board was to have control of the books, and with regard to giving the Companies access to them, depended upon who controlled the working of the Board before the arbitation took place. But even if they were well inclined to one another, certain difficulties would remain. If the Companies would be interested, as from one point of view was suggested, in letting down their works in the interval, so would the Board, inasmuch as, although the value was as on the appointed day, the actual inspection of the works would go on in practice till the time of and during the arbitration. But he did not believe that either the Companies or the Board would have an interest in so doing.

This concluded the evidence for the day, and the inquiry was adjourned till yesterday; the Chairman announcing that the Committee would also sit on Tuesday, Wednesday, and Thursday this week.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Tuesday, April 22.

(*Before the* LORD CHIEF JUSTICE *and Justices* DARLING *and* CHANNELL.)

Mayor and Corporation of Stockport v. Wright.

This was an appeal from the decision of the Magistrates at the Wilmslow Police Court, dismissing a complaint under the Stockport Water Act, 1861, as to the charge made for water used by an amateur photographer.*

Mr. LOEHNIS appeared for the Corporation; the respondent was not represented by Counsel.

Mr. LOEHNIS said the short point raised was whether the use of water for the purpose of photography could be properly called a "domestic use"—the Magistrates having decided that it was a domestic use. Of course, a professional photographer would have to pay an additional amount, as he would come within the words "trade, manufacture, or business;" but the question of the amateur photographer had not yet been decided. There was no finding on the case as to the quantity of water used; but a charge of 10s. had been made for the supply for the purpose of photography, which the respondent declined to pay. The respondent had fitted up a lavatory as a dark-room.

The LORD CHIEF JUSTICE said it was not stated whether notice had been given to the Water Company demanding a supply.

Mr. LOEHNIS said it might be that the Court would hold, as a matter of fact, that under no circumstances could the words "domestic use" include water used for the purpose of washing photographic plates.

Justice CHANNELL asked whether a man was liable to pay an additional rate if he used an extra pint of water to wash a plate.

Mr. LOEHNIS replied certainly not; but where there was a continuous flow for several hours, and a laboratory and dark-room had been constructed, the water ought to be paid for.

The LORD CHIEF JUSTICE said he supposed they would not be asked to say that under no circumstances could water be used by amateur photographers.

Mr. LOEHNIS said he should not so contend; but he did say that "domestic use" did not include a permanent photographic room.

Justice DARLING said he supposed the water was wanted for washing the plates.

Mr. LOEHNIS said it was for washing the plates and proofs.

Justice DARLING asked whether that could not be done by having water in three or four pans.

Mr. LOEHNIS said he understood the practice was to put the plates in a basin, and let the water run all night.

Justice DARLING: In this case, we cannot tell what was done.

Mr. LOEHNIS said that was so, as the case stood. According to his instructions, one or two important facts had been left unstated—such as the fitting up of the dark-room and that an expert who was called on behalf of the respondent stated that, for the purpose of successful photography, the water must be allowed to run on the plates for at least two hours.

Justice CHANNELL: Do you say, if a gentleman once did it to wash one set of plates, that he would be liable to pay the extra water-rate?

Mr. LOEHNIS said he should not like to say that.

Justice CHANNELL said all that was found in the case was that water had been used.

Mr. LOEHNIS admitted that the case had been stated in such a way that a satisfactory answer could not be given to the question.

The LORD CHIEF JUSTICE said he thought the point meant to be raised was with regard to amateur photography. As it stood, the Court could not answer the question either way satisfactorily—certainly not in favour of the appellants. The case must go back to the Magistrates for them to state the full user of the water.

* See "JOURNAL," Vol. LXXVIII., p. 1323.

Claim for Compensation under the Employers' Liability Act.

At the Westminster County Court on Friday, before his Honour Judge Woodfall and a Jury, the case of *Edwards v. Gaslight and Coke Company* came on for hearing. It was a claim under the Employers' Liability Act for damages for personal injuries sustained by the plaintiff through the alleged negligence of the defendants. Mr. E. Browne appeared for the plaintiff; Mr B. A. Vaughan Williams represented the Company. Mr. Browne said the plaintiff was employed as a labourer at the Company's station at King's Cross for 16 years prior to 1894. He left their service, but returned in December, 1901, when he was put to do rather different work from that which he left in 1894. He had to work on an overhead railway upon which coal trucks were run. Plaintiff was pushing a truck on the 4th of December—a wet, foggy morning—and had moved it some 30 yards, when he suddenly fell through a trap in the centre of the railway and injured his knee. He returned to work a fortnight after, but his knee became so bad that he had to leave. Compensation was refused. The negligence alleged was that the railway was badly lighted, and that the trap, which was for shooting the coal through, should not have been left open. These facts having been proved in evidence, plaintiff was cross-examined, and stated he had never worked on this particular viaduct before. He did not see why it was impossible for shooting-holes to have lids to them, as they had formerly. The medical evidence showed that when examined by the doctor on the day of the accident plaintiff had over the left knee-joint a lacerated wound which suppurated, and did not heal quickly. For the defence, Thomas Lacy, a man employed at the works, said that plaintiff had previously been engaged many times on work similar to that which he was doing on the morning of the accident. There had never been lids for the shooting-holes, as it would be impracticable to have them. There were gangways running along outside the rails, and men pushing the trucks had to walk along them; they had no right to push trucks behind, as the plaintiff had admittedly been doing. The foreman who put Edwards to work said there was plenty of light at the spot where the accident happened. Several other witnesses were called, and stated that there had never been lids to the holes. Eventually the Jury found for the Company.

Abstracting Money from a Prepayment Meter.

At the Gateshead Police Court, last Wednesday, Thomas H. Taylor was sued for 2s. 6d., damage done to a penny-in-the-slot meter, the property of the Newcastle-on-Tyne and Gateshead Gas Company, and for 3s., the amount that should have been in the meter. Lucretia Taylor, the sister of the defendant (who was stated to be at sea), said that the house was broken into during her absence, and the damage was then done and the money abstracted. For the Company, it was urged that Lucretia Taylor was the tenant, and that she was responsible. The Bench gave judgment for the Company.

Gas-Fitter Fined for Unlawfully Using Gas.

At the Borough Police Court, Doncaster, on Monday last week, Arthur Brewitt, a whitesmith and gas-fitter, was charged with unlawfully using gas, the property of the Corporation. Arthur Crabtree, an inspector, stated that he read the meter for the previous tenant (Mr. Boddy), who left the premises on Nov. 16, 1901, and the figures stood at 27,200 cubic feet. He turned off the gas at the main. Defendant took possession on the 18th of November, and the tap was then turned on again. Witness took the register on the 9th of December, and the gas consumed was 300 cubic feet. The two connections had not been made when he read the meter for Mr. Boddy. It was fixed on a shelf in the workshop, about 8 or 9 feet from the ground. David Tyson, fitter, said, the defendant not having paid the 10s. deposit, he was instructed to fetch the meter away. It was when he did this that the two pipes connected with it on the wrong side were discovered. He found these pipes attached to two brackets on the wall, and the gas supplied to them would therefore not pass through the meter. A boy told him he had made the connection by defendant's orders. Richard Crawshaw, apprentice, said that some time in February there was an escape of gas, and defendant told him to see to it. The gas from the fittings he put in was used at times. Mr. R. Bridge, Gas Engineer to the Corporation, said the burners would consume 4 cubic feet per hour; and he estimated that the gas utilized during February would amount to some 80 feet, which, at 2s. 9d. per 1000 feet, would be worth about 2d. Defendant was sworn, and stated that he instructed the lad to attend to a leakage of gas. On the following Saturday, when he went to the shop, the boy told him he had found the escape and made it all right. He had to go away on business, and therefore had not time to inspect the work. After the meter had been taken away, he went to the office of the Gas Manager and said he was sorry for the mistake. The boy had taken off the two pipes joined to the outlet, in which the escape was, and had refixed them to the inlet-pipe. The Bench were satisfied that defendant was cognizant of the connection having been made; and he was fined 20s. and costs.

Okehampton Corporation and the Gas-Works.—The Okehampton Town Council had under consideration yesterday week a letter from Mr. F. Edwards, Secretary of the Gas Company, in reference to the Council's suggestion that the Company should undertake the lighting of the public lamps until Christmas at the rate of £2 12s. per lamp per annum. Mr. Edwards pointed out that the Company are under contract to light the lamps until the 1st of July next at the rate of £3 per lamp per annum, and said that the quotation of £2 12s. was made conditionally upon the Council entering into a five years' agreement. As the Company would require more storage to meet the increased demand, they could not proceed further unless the Corporation entered into a definite agreement. Any such agreement would not affect the right of the Council to negotiate for the purchase of the Company's undertaking. It was decided that the letter should be referred to the Committee appointed to consider the question of purchasing the gas-works, and that a meeting of the Committee should be held at an early date.

MISCELLANEOUS NEWS.

PARIS GAS COMPANY.

Report and Accounts for the Year 1901.

The following is an abstract translation of the report of the Directors of the Paris Gas Company on the working of the undertaking in the year ending Dec. 31 last, with the principal items in the accounts.

In the twelve months which closed on the above-named date, there were sent from the Company's works 335,803,091 cubic metres, or about 11,854 million cubic feet, of gas, compared with 349,913,618 cubic metres, or 12,352 million cubic feet, in the previous year; being a decrease of 14,110,527 cubic metres, or 498 million cubic feet. The Directors, however, point out that 1900 was the year of the Exhibition, and that in 1899, which was an ordinary year, the total consumption was 325,874,000 cubic metres, or about 11,504 million cubic feet, which was a great deal below that of 1901. In the day consumption, there was the very small decrease of 158,494 cubic metres, or rather more than 5½ million cubic feet. Comparing the figures with those for 1899, there was a difference of 14,223,107 cubic metres, or 502 million cubic feet, in favour of last year. This progress is, of course, due to the more general use of stoves, engines, &c. The revenue from the sale of gas amounted to 86,882,140 frs. (£3,475,286), or 2,360,307 frs. (£94,412) less than in 1900. Of the total, 78,903,560 frs. came from the city, and 7,978,580 frs. from the surrounding districts. The number of consumers at the close of the year was 473,656—an increase of 19,071, of whom 12,847 were new customers on the "free fitting" system.

The number of burners in the public lamps on Dec. 31 last was 63,994, of which 51,418 were employed in lighting the city and 12,576 were in use in the suburbs; being an increase of 954—662 in Paris and 292 outside. The Municipalities displayed more activity last year than in 1900 in substituting Auer, Denayrouze, St. Paul, and other burners, for the ordinary jets in the public lamps. The extent to which the different kinds are used is shown in the following table:—

Kind of Burner.	1900.	1901.	Inc.	Dec.
Ordinary	31,008	10,204	—	20,804
Auer	15,518	37,028	21,510	—
Denayrouze	2,984	2,992	8	—
St. Paul	1,109	1,104	—	5
Regenerative	137	90	—	47
Total	50,756	51,418	21,518	20,856

The great improvement effected in the public lighting by these changes is leading to the gradual extension of the incandescent system to all the streets of the city. The number of rising mains laid on last year was 750; bringing up the total to 50,050. The consumers served from them at the end of last year numbered 332,517, against 315,698 at the corresponding period of 1900; being an increase of 16,819. The proportion of consumers supplied in this way is 70·20 per cent. of the entire body; and they took 65,106,592 cubic metres, or about 2298¾ million cubic feet, out of the total quantity of gas sent out.

With regard to the works and plant, no extensions were carried out during the past year; the appliances at the various stations being equal to the demands made upon them. The distributing system, however, was extended by about 19,176 yards—13,212 yards in the city, and 5964 yards in the suburbs. This brought up the total length of mains on Dec. 31 last to 2,772,129 yards—1,827,090 yards within, and 945,039 yards beyond the city. There was a net sum of 2,757,947 frs. (£110,318) expended for capital purposes last year; and at the close the account stood as follows:—

	Francs.	Sterling.
Amount expended to Dec. 31, 1900	330,013,037	£13,200,521
,, ,, during 1901	2,757,947	110,318
Total	332,770,984	£13,310,839

To meet this, there has been raised: By shares, 84,000,000 frs.; by bonds, 254,004,189 frs.—together, 338,004,189 frs. To this total must be added a sum of 2,246,799 frs. taken from the revenue in 1900 to meet capital expenditure in excess of 3,200,000 frs.; making in all 340,250,988 frs. (£13,610,039). There is consequently an unexpended balance of 7,480,004 frs (£299,200). The capital is represented by 336,000 shares and 553,332 bonds. At the date of the report, there had been redeemed 262,421 shares and 398,966 bonds; so that 73,579 shares and 154,366 bonds remain for redemption.

The following is the working account for the past year:—

Expenditure.

	Francs.	Sterling.
Value of gas in store on Jan. 1, 1901	40,109	£1,604
Manufacture of gas—		
Coals carbonized	23,783,203	951,328
Coke and tar for heating purposes	4,930,921	197,237
Salaries and wages	5,182,086	207,283
Maintenance of works and plant	2,002,682	80,107
Incidental expenses of carbonization	1,373,512	54,941
Purifying materials and labour	370,198	14,808
Distribution—		
Salaries of Engineers and officers	2,936,132	117,445
Repairs, &c., of mains and services	1,687,662	67,506
Miscellaneous expenses, stamps, &c.	552,713	22,109
Gratuitous installations of fittings	984,903	39,396
General management (including interest and sinking fund payments)	26,238,629	1,049,545
Pension and provident funds	1,943,721	77,749
Municipal charges—		
Tax of 2 c. per cub. met. of gas sold	5,721,652	228,866
Rent of subsoil occupied by mains, &c.	200,000	8,000
Lighting, extinguishing, and maintenance of public lamps (less amount paid by Municipality)	1,422,958	56,919
State charges—		
Official gas testing, stamps, &c.	1,138,295	45,532
Total expenditure	80,509,376	£3,220,375

Revenue.

	Francs.	Sterling.
Value of gas in store on Dec. 31, 1901	61,730	£2,469
Sale of gas	86,882,140	3,475,286
Residual products—		
Coke	19,425,343	777,014
Tar	1,790,425	71,617
Ammoniacal liquor	1,703,005	68,120
Rental of meters and fittings on hire	2,351,046	94,042
Interest and discount	1,250,400	50,016
Fire-clay goods	28,628	1,145
Total revenue	113,492,717	£4,539,709
Deduct expenditure	80,509,376	3,220,375
Balance, profit for 1901	32,983,341	£1,319,334
Add balance from 1900	6,951	278
	32,990,292	£1,319,612
Deduct to meet outstanding claims	390,292	15,612
Balance available for distribution	32,600,000	£1,304,000
Deduct for share dividend	11,200,000	448,000
Balance, divisible equally between the Company and the Municipality	21,400,000	£856,000

The total amount coming to the shareholders is therefore:—

	Francs.	Sterling.
Dividend as above	11,200,000	£448,000
Half of divisible balance	10,700,000	428,000
Placed to shareholders' credit, as per resolution of March 23, 1875	50,000	2,000
Balance of undivided profits	178,784	7,151
Total	22,128,784	£885,151
Deduct 1 fr. per share for reserve fund (336,000 frs.) and the complement of the share redemption fund ordered by the State Council to be borne by the shareholders (3,077,042 frs.)	3,413,042	136,522
Balance	18,715,742	£748,629
Deduct interim dividend of 12 frs. 50 c. per share paid in October last	1,122,963	44,918
Balance	17,592,779	£703,711

This allowed of the payment of a final dividend of 51 frs. 50 c. per share, making 64 frs. for the year; leaving a balance of 288,779 frs. (£11,551) to be carried forward. The dividend was 3 frs. per share higher than that declared last year.

Following the accounts is the portion of the report dealing with the residual products and the gas-stove business. The revenue from the sale of coke was 935,973 frs. (£37,439) more last year than in 1900; but tar and chemical products yielded 699,827 frs. (£27,993) less. The Company's show-rooms were well visited, and orders were received for 6879 heating and cooking appliances. With regard to gas-engines, every year sees greater progress in the employment of these motors. On the 31st of December there were 3381 in use, of a total capacity of 14,430-horse power; being an increase of 197 engines and 1114-horse power as compared with the corresponding date in the preceding year. During 1901, the gas consumed by these engines amounted to 11,028,339 cubic metres, or rather more than 389¾ million cubic feet; being an advance of 184,339 cubic metres (6½ million cubic feet) on the figures for 1900.

The report furnishes, as usual, full particulars in regard to the provident, pension, and savings funds connected with the Company. Last year the expenses of the provident fund amounted to 528,670 frs. (£21,147); whereas the receipts were only 429,000 frs. (£17,160); leaving a deficiency of 99,669 frs. (£3987). This amount was consequently charged to the year's working. There are two pension funds—one for the workmen and the other for the clerks, &c. The amount of the former at the close of the past year was 1,208,062 frs. (£48,322); and of the latter, 12,127,319 frs. (£485,093). Portions of each of these funds are invested in the Company's bonds. The balance of the savings fund at the close of the year was 297,161 frs. (£11,886).

Towards the end of the report, a few lines are devoted to the project which has been approved by the Municipal Council and adopted by the shareholders for the transfer of the undertaking to a "farming" company. The scheme was embodied in a Bill introduced by the Government on the 12th ult., and referred to a Committee. As mentioned in our editorial columns last week, it has been adversely reported upon by M. Colliard, and sent to the Council of State for examination. It is stated above that the scheme was "adopted" by the shareholders of the Company. They were, however, not all of one mind on the subject; and some of the dissentients went so far as to take steps to have the resolution arrived at set aside by the Tribunal of Commerce of the Seine. But, so far as we can gather from the report, there has been no judicial pronouncement on the matter.

Rochdale Water Supply.—At a recent meeting of the Water Committee of the Rochdale Corporation, the Engineer (Mr. W. Tomlinson) submitted an interesting report on the past year's operations. He stated therein that the receipts for water for domestic use had increased by £648 12s. 10d. during the twelve months, and that the rentals for water supplied by meter for trade purposes showed an increase of £1616 5s. 6d., or a total of £2254 18s. 4d. In the previous twelve months, the total increase was £1467 2s. 8d. A considerable portion of the additional revenue now reported was due to the dry weather of last summer and to increased charges for water. The total receipts for water supplied from the Rochdale reservoirs exceeded the expenditure by £604 16s. 8d. On the Todmorden water-works account, there was a deficiency of £4852 4s. 1d.; being a decrease of £171 12s. 1d. as compared with last year. The receipts from householders showed an increase of £131 2s. 1d., and those for trade purposes an increase of £337 10s. 10d. The actual deficiency in the two accounts is £4247 7s. 5d., or £610 0s. 4d. less than that reported in 1901.

GAS EXHIBITION IN NEWCASTLE.

Under the auspices of the Newcastle and Gateshead Gas Company, an exhibition of gas appliances, on a larger scale than has ever been attempted in the city, was opened on Monday last week, in the Olympia, by the Chairman—Sir W. H. STEPHENSON. The desire of the Company was, of course, to make the exhibition as comprehensive as possible; and with the co-operation of the manufacturers of gas appliances of various kinds, and the valuable help, in the arrangement of the exhibits, of the Company's Chief Engineer, Mr. W. Doig Gibb, and their Managers—Messrs. Thomas Hardie and J. Lewis—and the able assistance of the Secretary, Mr. T. Waddom, they have been eminently successful.

Among the appliances shown are model kitchens, cookers, grillers, gas-fires, condensing stoves, ovens for all purposes, laundry appliances, greenhouse stoves and boilers, laboratory and workshop appliances, chimney-pieces, water-boilers, gas meters and fittings, cooking utensils, incandescent light appliances, and numerous other articles employed in lighting and cooking. The Company themselves have an interesting display, including a small gas-works, in which gas is made at frequent intervals, old types of meters, coal-tar products, and scientific instruments and apparatus used in gas-works. The employment of gas light for photography is demonstrated by Mr. E. G. Brewis, who has a studio where he takes pictures by the incandescent light.

Sir W. H. STEPHENSON, in opening the exhibition, said he had an opportunity of inspecting the exhibits, and he must say he was utterly amazed at the perfection and beauty of the things he had witnessed. Some people had thought that the exhibition was to blow the trumpet of the Gas Company, and to let the people of Newcastle and Gateshead see what the Company could do. While he was not ashamed of the Company, and what they had done in the past or would be able to do in the future, he might say that the exhibition was chiefly for the advantage of those firms who manufactured articles used in the distribution and consumption of the gas made by the Company. He ventured to think that, when the public had had an opportunity of inspecting the exhibits, they would come to the conclusion, as he had done, that the exhibition was a highly satisfactory one, and reflected much credit on all who had had to do with it. Last year, there were no fewer than seventeen exhibitions of gas apparatus in Newcastle; and Mr. Waddom, the Secretary, informed him that he had had applications for twice the number this year. The conclusion to which Mr. Waddom and he and the Directors had arrived was, that people were in danger of becoming surfeited with shows of gas apparatus; and, to settle the matter, once for all, they resolved that they would go in for one large display, and do away with the 34 exhibitions they would have had under other circumstances. The exhibition, he continued, covered everything the smaller ones would have contained. Gas could be used for an almost unlimited number of purposes; and they had a good expression of them in the apparatus and appliances they saw before them. There would be demonstrations in cooking going on all day, including high-class work and cooking for artisan households. The cooking-stove had become a necessity in the household. This was shown by the development of the stove department of the Company. During the last eighteen months, they sold 2000 gas-stoves, and more than 7000 penny-in-the-slot meters. The consumer might purchase or hire a stove capable of cooking a dinner for nine people at a cost of less than a halfpenny. If they could get working men to understand this, it would be a very desirable thing. The lighting of the hall, they would agree, was extremely pleasant and beautiful; and he was told that there were lamps of 25,000-candle power, lighted at high pressure by means of compressed gas, the machinery for which was in the annexe. The motive power was the town water supply, available at any time. The system was suitable for large shops, public halls, railway stations, and workshops. In the Company's exhibit, there were old oil-lamps, similar to those once used in the city, modern lights, and gas-meters. There would be a series of lectures—on "Coal and Its Uses," by Mr. O'Connor; on "The Manufacture of Coal Gas," by Mr. Thomas Hardie, one of the Company's Engineers; on "The Use and Abuse of Coal Gas," by the Chief Engineer of the Company, Mr. Doig Gibb; also lectures by Mr. Herbert Lees and Mr. Hooper. People had been talking as if they considered that gas manufacturers had seen their best days, and were coming to decay. He did not believe anything of the sort. He thought there were better days before the gas manufacturer than ever there had been behind him. It was a mistaken idea to suppose that they were on their last legs. Twenty years ago gas had practically a monopoly as an illuminant. Now they had healthy competition from electricity, petroleum oil, &c.; and this had stirred up the manufacturers of gas to do their level best to produce apparatus of the most economical kind, to enable the consumer to take as little gas as possible, and make the best use of it. The gas engineers of this and other countries had risen to the occasion. The introduction of the Welsbach incandescent burner had brought about a revolution in gas lighting, giving 600 times the light of an ordinary gas-jet with a considerable reduction in consumption. In 1890, there were 594 gas companies in the United Kingdom, and in 1900 there were 693—an increase of 99. The amount of capital invested in gas undertakings in 1890 was £61,344,000, while in 1900 it was £102,924,000—an increase of £41,500,000. In 1890, there were 94,645 million cubic feet of gas manufactured; and in 1900 the quantity was 140,415 million cubic feet—an increase of 45,770 million cubic feet. The number of consumers of gas in 1890 was 2,297,000; while in 1900 it was 3,713,000, an increase of 1,416,000. The total number of public lamps in 1890 was 460,384; in 1900 it was 605,156—an increase of 144,772. That did not look like a dying industry. The Newcastle and Gateshead Gas Company had grown wonderfully since 1838, when they made 17 million cubic feet of gas, and used 5660 tons of coal. In 1901, they made 2,714,375,000 cubic feet of gas, and used 283,561 tons of coal. In conclusion, he expressed his obligations to Mr. Waddom, Mr. Gibb, Mr. Lewis, Mr. Hardie, Mr. Garbutt, and other officials of the Company, for the assistance they had given in connection with the exhibition. He had little doubt that it would realize the anticipations of its promoters, and be a source of joy and satisfaction to the people of the neighbourhood.

THE EXAMINATIONS IN GAS MANUFACTURE.

The Question Papers Set at the City and Guilds of London Institute Examinations.

The examinations in "Gas Manufacture" conducted by the City and Guilds of London Institute were held last Saturday afternoon. The following were the questions set by the Examiner (Dr. Harold G. Colman):—

HONOURS GRADE.

1. Sketch the construction of a setting of inclined retorts 18 feet in length, so far as relates to the furnace, and the manner in which the furnace gases are conveyed to, and the waste gases from, the setting, but not including the retorts themselves. 2. Discuss the importance of maintaining the hydraulic main level and the dip-pipes of equal length. What results follow when these precautions are not observed? 3. What is the effect of the admission of atmospheric air to the crude gas before purification? What considerations place a limit on the amount of air which should be added? 4. Sketch the construction of a puddled gasholder tank, and explain shortly the method of construction adopted. 5. How would you determine the percentage of sulphuretted hydrogen, carbonic acid, oxygen, and carbonic oxide in a sample of crude gas? 6. How would you determine the calorific power of a combustible gas? What is the difference between the "gross" and the "net" calorific power? 7. What steps would you take to put matters right in the case of a purifier lute "blowing"? 8. State the effects of the following points in the manufacture of carburetted water gas: (*a*) Variation in the quantity of air admitted during the "blow;" (*b*) variation in the quantity of steam admitted during the "run;" (*c*) variation in the temperature in the carburettor and superheater. 9. A 12-inch trunk main has to be replaced for some distance by an 18-inch main, the new main being laid in a fresh trench parallel to the old one. How would you connect up the new main without interrupting the gas supply to the district beyond? 10. Discuss the relative advantages and disadvantages of the supply of "low-grade" gas under modern conditions.

ORDINARY GRADE.

1. Illustrate by sketches the construction of a setting of seven retorts, exclusive of furnace, showing the manner in which the retorts are supported throughout their length. 2. Explain the construction of the hydraulic main, and state the functions it has to perform. 3. State the general properties of coal tar, and give some account of its most important constituents. 4. Ammonia is found to be present in considerable quantity in the gas after passing the washers and scrubbers. To what cause may this be due, and how would you propose to remedy matters? 5. How would you determine the total ammonia present in a sample of ammoniacal liquor? Explain the chemical principles on which the test depends. 6. In what respects is the use of oxide of iron preferable to that of lime for the removal of sulphuretted hydrogen from crude gas? What are the chemical reactions which take place in oxide purification? 7. What results follow when a retort is unevenly charged with coal? 8. What is the object of the pressure-gauges fixed on the various portions of the manufacturing plant of a gas-works? Sketch the construction of a recording pressure-gauge. 9. For what purpose are syphons employed in gas-distributing mains? Sketch the construction of one, and state the position in which it must be fixed. 10. A house is to be fitted with gas-pipes to supply lights in six rooms and a kitchen cooking stove. What precautions would you take to ensure a good supply of gas at all points, and to avoid any accumulation of condensed water?

In the ordinary grade, 39 marks were allowed for Nos. 1, 5, 8, and 10; and 36 for each of the rest. In the honours grade, 39 marks were allowed for Nos. 1, 4, 8, and 10, and 36 for each of the rest. Four hours were allowed for each paper; and not more than eight questions were to be attempted.

MANCHESTER CORPORATION GAS SUPPLY.

Intensified Gas Lighting.

Reference has already been made in our columns to the installation of high-pressure gas lighting which the Gas Committee of the Manchester Corporation a short time ago authorized the Gas Engineer (Mr. J. G. Newbigging, Assoc. M.Inst.C.E.) to fit up in the vicinity of the new Municipal School of Technology. It comprises 27 lamps of hexagon shape, measuring 42 inches across, each containing three burners; and they are located in Whitworth Street, Granby Row, and Sackville Street, which surround the school on three sides. The compressors are placed in the basement of the school, and the gas is sent to the lamps at a pressure of 8 inches by a 3-inch main running round the building. The installation was determined upon in consequence of the highly satisfactory results attending the trial of the high-pressure system in Piccadilly; and in carrying it out Mr. Newbigging had the co-operation of Mr. W. C. Waddington, the Superintendent of Street Mains and Lighting. Mr. J. E. Gresty represented the Welsbach Company in the matter. The lamps were brought into use for the first time on Monday evening last week, when a number of members of the Gas Committee witnessed their inauguration. The Company included the Lord Mayor (Alderman Hoy), Alderman Gibson (Chairman of the Gas Committee), Alderman Briggs (Deputy Chairman), Mr. Newbigging, and Mr. Price (Deputy-Superintendent). The effect of the new lamps was exceedingly brilliant—lighting up the thoroughfares with great power, and commanding the unstinted admiration of all who witnessed it. The opinion was expressed, and cordially agreed in, that it would be advisable to instal the system in Albert Square and the streets around the Town Hall as early as possible.

After the inspection, the party returned to the Gas Committee's room at the Town Hall, where Alderman Gibson presided over the assembly, and proposed the health of the Lord Mayor. He referred to his Lordship's work as Chairman of the Technical Instruction Committee, and said it had given the Gas Committee great pleasure to put a girdle of

bright light around the noble building to which the Lord Mayor had devoted the best years of his life, and which must for ever be indissolubly associated with his name. Brilliant and magnificent as was the illumination, the installation would not cost the ratepayers so much per 1000 candles per hour as would the light from the same quantity of gas consumed with the old flat-flame burners which were in vogue a dozen years ago. Gas undertakings in this country were very much indebted to the Welsbach Company for the incentive given in showing what could be done with gas in the way of town illumination. By the old-fashioned method, the cost would have been at least 6d. per 1000 candles per hour, while in the present instance it would not be quite 1⅜d. The last-mentioned figures were obtained from the actual experience gained by the Committee in a year's trial of the high-pressure gas installation in Piccadilly. The cost was also less than one-half that at which an illumination of the kind could be produced by electricity. He believed the Committee would be able to show that gas would be the light of the future for streets and houses. There would still be plenty for electricity to do, both in Manchester and elsewhere, in finding power for tramways and other purposes, and in lighting large buildings. The Lord Mayor, in responding to the toast, expressed his personal thanks to the Gas Committee for having so brilliantly lighted the outside of the Technical School. The incandescent light, he said, had been a great boon to the community; and he hoped it was a profitable field for those who had been engaged in its development. When it was known that so brilliant a light was to be had at less cost than the old-fashioned street lighting, he thought the Committee would be put under pressure from other directions in order to increase the gain that must result from well-lighted thoroughfares. These remarks were in no way derogatory to the Electricity Committee, who had ample work to do. It was not their fault, but their fate, that gas had overtaken electric light as an illuminant. Alderman Gibson's health was proposed by the Lord Mayor, and was cordially received; that of Alderman Briggs following. The proceedings then closed.

The Gas Profits—Proposed Reduction in Price.

Earlier in the day, the Gas Committee had a meeting to consider the estimates for the current municipal year. Last year, it may be remembered, it was estimated that £50,000 would be raised to relieve the rates in profits on the gas undertaking. To obtain this sum, it was decided to increase the price of gas from the June quarter of 1901 3d. per 1000 cubic feet, making it 2s. 9d. to city consumers and 3s. to outsiders. The gross profits for the year ended March 31, 1902, were £146,494. From this sum there was paid in interest £44,116, and to the sinking fund £45,128; making together £89,244, and leaving a net profit of £57,250. Of this, £50,000 went in relief of the rates, and the remainder to the contingent and reserve fund. It was estimated that for the year ending March 31, 1903, the gross profits will reach £171,600, from which must be deducted £91,446 for interest and sinking fund; so that there would remain a net profit of £80,154. In the opinion of Alderman Gibson, the Chairman, this sum is certain at the present prices, and he will not be surprised to see a considerably greater profit. The Committee agreed to recommend that out of the £80,000 there should be paid £50,000 in relief of the rates and £7000 for a proposed reduction in price from 2s. 9d. to 2s. per 1000 cubic feet to owners of gas-engines, and that the remainder should be paid over to the contingent and reserve fund.

INCANDESCENT GAS LIGHTING AT CROYDON.

Extra Charge for Incandescent Lamps Discontinued.

With a view to facilitating the adoption of incandescent gas-burners in the street-lamps in their district, and thereby improving the public lighting, the Directors of the Croydon Gas Company have decided to discontinue the charge of 4s. 6d. per lamp per annum hitherto made for incandescent burners above the charge for ordinary flat-flame ones. This reduction will take effect (as regards such public lamps as were on the 14th inst. supplied with incandescent burners) from June 30 next, and no extra charge beyond the charge for flat-flame lamps will be made in respect of new public lamps with incandescent burners erected after the 14th inst., or of lamps which may be after that date changed from flat-flame burners to incandescent ones. It may be of interest to readers to know that in the Croydon Gas Company's district there are 1543 public gas-lamps erected, 928 of which have incandescent burners attached to them; leaving 615 with the ordinary flat-flame burners. The extra payment which has been made by the Council for the incandescent burners has been 4s. 6d. per annum, less 5 per cent., which, on the full number of lamps, represents £333 per annum. The Corporation have passed a vote of thanks to the Company for their liberality.

GREENOCK CORPORATION GAS SUPPLY.

The Proposed Improvements at Inchgreen.

At a recent Meeting of the Corporation of Greenock, Mr. Morison, the Vice-Convener, moved the adoption of the minutes of the Gas Committee, which showed that the Committee had considered the report by the Sub Committee on Works on the proposed improvements and alterations at Inchgreen, in which the adoption of Messrs. West's scheme as a whole was recommended. The Committee, at a meeting on the 11th inst., agreed to the proposal of the Convener, who moved the approval of the Sub-Committee's report, and that the whole subject be remitted to the Land and Finance Committee for their consideration, asking the Committee to have a special meeting of the Corporation convened on as early a date as possible, and, if so resolved, to recommend that the Corporation approve of the scheme proposed by West's Gas Improvement Company, Limited, and to entrust the execution of all the work embraced therein to the Company; such portions thereof as

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are apart from their own specialities to be sublet to local contractors, on condition that such sub-contracting should be found to be more economical, but always provided that the Company undertake the sole responsibility as Contractors-in-Chief for the entire work. This resolution was come to by eight votes to one against an amendment by Mr. Mitchell. It was agreed to ask that powers should be given to have an independent report prepared showing the condition of the gasholders at Inchgreen, and also to have No. 1 holder repaired, if found necessary and expedient; further, to have expert advice on any portion of the plant not included in Messrs. West's report.

In moving the adoption of the minutes, after referring to the question of the holders, Mr. Morison called attention to the fact that Mr. Mitchell had been added to the Works Sub-Committee; and in view of the industry and experience of that gentleman, he thought the Sub-Committee were to be congratulated. Mr. J. W. Bailey, who seconded the motion, said the matter of the gasholders appeared to be very serious. They had noticed in various reports—and he thought the trial balances would bring it out—that there had been a great leakage of gas. As a Committee, they could not be held responsible; and they felt that it was imperative that not only this, but other portions of the works should be looked over, so that they might fully realize the true condition of the gas-works. He understood that, before Mr. Stewart resigned, he presented to the Committee a statement of what was required to be done in order to put the works into proper condition; and he thought it was only justice to him that this should be mentioned. Dean of Guild Brown said he preferred Mr. Morison's proposal, that the Manager should be asked to draw up a report on the holders. If an expert was wanted at all, surely the common-sense way would be to put the whole of the plans and alterations before him, including Messrs. West's report. He moved that this portion of the minutes be taken back by the Committee. Bailie Baxter, in seconding the amendment, said he did not know how many more experts would be required before they were finished with this matter. This calling in of experts was really a vote of no confidence in the Manager. Mr. Mitchell said he did not think all the holders required examination; but when the expert was there, he might do worse than go round them all, and see if there was anything wrong. In conclusion, Mr. Mitchell said he wished to withdraw from the Sub-Committee on Works, as events had happened since his appointment which made it imperative on him not to be a member. Messrs. Nicholson and Lamont having made some remarks, Mr. M'Callum said that, at the special meeting of the Corporation held three weeks since, urgency was emphasized in connection with this matter; but at the last meeting of the Committee, the Manager assured them that he could rub along for another year with the expenditure of a few hundred pounds—about £1500. Mr. Morison then replied on the discussion; and, on a division being taken, the amendment was carried by 9 votes to 8.

The Ripon City Council on Thursday night adopted a recommendation of the Gas Committee to expend an additional sum of £1000 on the works; £695 being for new retorts.

RIVER PLATE GAS COMPANY.

The Annual General Meeting of this Company was held on Monday last week, at River Plate House, Finsbury Circus, E.C.—Mr. A. E. BOWEN in the chair.

The SECRETARY (Mr. Ernest Heald) having read the notice convening the meeting, the Directors' report and the balance-sheet were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said last year was an anxious one for nearly every company doing business in the Argentine, as owing to fears of international complications, to the ruinously low prices ruling for wool, and to drought having affected the wheat badly in the northern provinces, the commercial situation became very strained, and great caution was necessary. The Company's business, of course, was a steady going one, not exposed to any great fluctuations; but nearly all through the year, they had a falling off in consumption, caused almost entirely by their customers feeling the need of economizing in every way, so that, where the shops formerly kept open until ten or eleven o'clock, they closed at seven or eight, and, instead of burning three gas-jets, they satisfied themselves with one. Perhaps the shareholders would be able to better realize the state of things in Buenos Ayres, when he told them that, at the end of the year, there were no fewer than 9000 houses empty in the city, where formerly it was very difficult indeed to find any to let. Shortly after last year's meeting, the Municipality, with the object of economizing, ordered the Company not to light up some 400 odd of the street-lamps they were supplying; and even at the end of the year, they were only lighting 6773 against 7096—a difference of 323, which, of course, meant a large quantity of gas. The contract for lighting part of the city with incandescent burners was being gradually carried out; and the lamps had given the greatest satisfaction. From what he had said, it might be imagined that the falling off in consumption was a serious one; but it was not so. It amounted to 5 per cent., which was just what the Company gained the previous year, so that there was nothing to worry about; and when better times came round, as they would do shortly, they would pick up the lost ground. Indeed, this year there was already an improvement. The network of mains had been extended by nearly 10 miles; and altogether they had now 373 miles of mains. On balance, they obtained during the year 933 new customers; making the t tal above 26,000. Owing to high freights and dear coal in the last months of 1900, their average cost of coal for the past year was higher than in the previous one; but they had been fortunate in their contracts and freights during the last six months. The Directors had every confidence of effecting considerable economy under this head in the current year; and, after making many experiments, they had found the class of oil most suitable for their new carburetted water-gas installation, which had worked well, and was a very great help to the business. Some of the shareholders seemed to be nervous about the electric light competition; and he had been asked by several whether the Electric Light Companies

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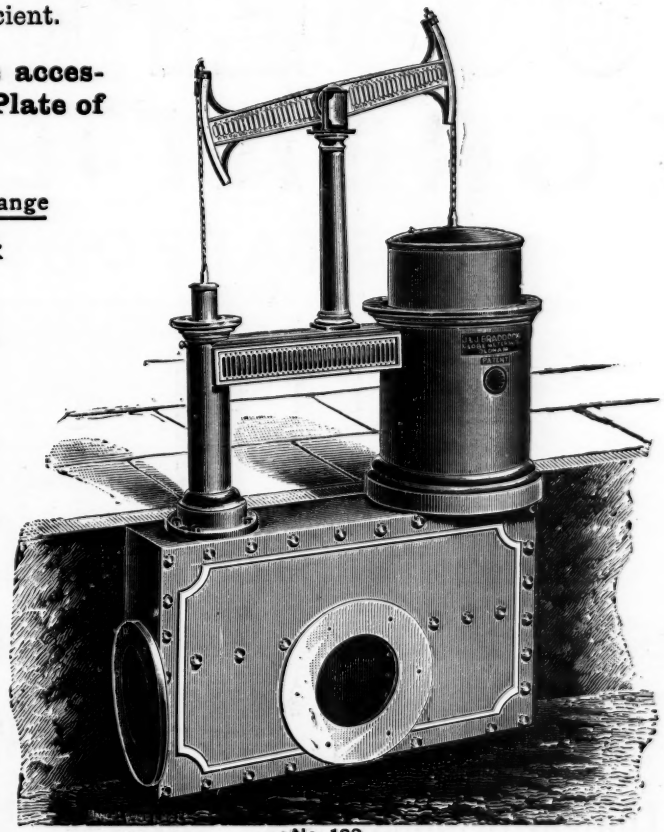

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were not cutting into the business. Of course, they did the Company some harm; but not much. As he mentioned last year, the Electric Light Companies took 51 customers from them. In 1901, they only took 34, which was a very small proportion of their 26,000, and was a good deal more than compensated for by their 933 new consumers. He believed 1400 houses altogether had both gas and electric light. But they had found lately that the tendency even in those houses was to burn more gas and less electricity; so he really did not think there was much cause for uneasiness on this score. Referring to the report and balance-sheet, the profit shown by the revenue account was £87,932, against £96,668—a falling off of some £8700; but, on the other hand, they had £1000 more from other sources, so that the total was £89,849 against £97,602. Some considerable part of this difference was accounted for by their having spent £21,997 on upkeep of the works and mains, against £20,847 in the previous year; and, further, they had written off out of revenue £2073 as special depreciation on the Almagro works. He explained that a lot of machinery which had not been worked for years had been moved from Almagro to Corrales and Belgrano. In view of this, they had a special valuation made of everything remaining at Almagro, with the result that, after consultation with the Auditors, the Directors deemed it advisable to provide out of revenue the somewhat large amount mentioned. But, of course, this would not occur again. The two items above accounted for some £3000 odd of the difference in the gross profits. The Directors' first care was to see that the works and mains were kept up to the very highest state of efficiency; and they were satisfied that their able Engineer (Mr. James Rowbotham), who was present that day, left no stone unturned to maintain everything in the best order, and he did it without undue expense. That the heavy yearly outlay in upkeep was justified and necessary was proved by the fact that their gas unaccounted for (which included robberies, &c.) was 1·58 per cent. less last year than the year before. This was principally in consequence of the care taken of their mains. With regard to the profit and loss account, debenture interest was £12,185, against £11,689, owing to the sale of some £7500 of the stock during the year, and to interest for the whole year being chargeable this time on the £20,000 placed last year. The London expenses were down about £70, notwithstanding the income-tax, which was a very heavy item. It really meant that the shareholders were getting nearly 7¾ per cent., if they approved of the 7 per cent. dividend proposed by the Directors. Among his other statements on financial matters, the Chairman said the capital expenditure of the year was £12,897, against £41,444 the previous year. Of this, £6000 odd went in the 10 miles of new mains laid; £6000 odd in new house services, meters, and street cocks (well represented by the 933 new customers), and the balance in new plant at Corrales and Belgrano. He hoped they would not have to spend much money this year, unless it was for new house services; and he did not mind how much they expended under that head. The stock of coal, gas, &c., stood at £71,709, against £73,648; and this notwithstanding the fact that they had 1310 tons more coal in stock, but the difference in cost was large. The sundry debtors and debit balance were up to £58,466, against £49,152; but this was entirely owing to the Municipality having fallen a little into arrear with their payments. The Directors, however, were promised that means would be found of paying the Company what was owing with very little delay. Their energetic Chairman of the Local Committee (Don Meliton Panelo) had this matter well in hand; and he (the Chairman) had not the least fear of his not collecting this account very soon. He had arranged with the Lord Mayor that in future the amounts collected by the authorities for the special lighting-tax would be kept separate, and paid to the Lighting Companies, and as the estimated yield of the tax more than covered the cost of the street lighting, the Company ought not to have any arrears to lament in future. They had already been paid their accounts for the first months of the year. Of course, the most ample provision had, as usual, been made for any doubtful outstandings. With regard to the dividend, the Directors proposed to give the shareholders the usual 7 per cent. (free of tax); and instead of placing anything to the reserve, which already stood at the substantial sum of £70,000, they intended to carry to next account £15,796, against £12,160.

Mr. A. T. Hooper seconded the motion.

In the course of a short discussion, which bore on points of no general outside interest, one shareholder suggested the publication of the revenue account. But this course was deprecated by another shareholder; and the Chairman pointed out that, as they were competing with two other Gas Companies, it would be foolish to give their business away. The Secretary, however, was always glad to see shareholders at the office, and give them any information.

The motion was unanimously agreed to.

A resolution was next passed, declaring a dividend of 8s. per share (making, with the interim payment of 6s., 7 per cent. for the year).

The retiring Directors (Messrs. H. G. Anderson and A. T. Hooper) and the Auditors (Messrs. Welton, Jones, and Co.) were re-elected.

The thanks of the shareholders were then accorded to the Secretary, the London staff, the Chairman of the Local Committee, and the General Manager (Mr. Gabarret) and staff in Buenos Ayres. In his remarks, the Chairman mentioned that the Chief Engineer (Mr. Rowbotham) was in England for a few months after an absence of eighteen years. He thought the Company were exceptionally fortunate in the possession of such a hard-working and conscientious official.

An Extraordinary Meeting was then held, at which a resolution was passed, altering the Articles of Association, so as to make them conform with the provisions of the Companies Act of 1900.

The services of the Directors having been acknowledged, the proceedings terminated.

The Directors of the Oriental Gas Company, Limited, have resolved to pay an interim dividend at the rate of 3½ per cent., free of income-tax, on account of the year ending the 30th of June next. This dividend is at the same rate as last year.

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NEW ENGLAND GAS AND COKE COMPANY.

Appointment of a Receiver.

It may be remembered that the name of the above Company was a good deal before the readers of the "JOURNAL" in the autumn of last year, in connection with the paper contributed by Dr. F. Schniewind to the Gas Section of the Glasgow Exhibition Congress, in which was described the coke-oven plant erected for the Company about four years ago at Everett, near Boston, by the United Coke and Gas Company of New York. We learn from the "American Gaslight Journal" that Judge Colt, of the United States Circuit Court, on the 7th inst. appointed Mr. Robert M. Burnett Receiver of the Company, on the application of the United Coke and Gas Company of West Virginia, who brought a bill in equity against Mr. Henry M. Whitney and others, Trustees. The basis of the proceeding is that the New England Company are in an insolvent condition, and unable to meet their obligations, including an indebtedness of $360,000 to the complainants. It was alleged that unless the Court interposed with the appointment of a Receiver, the property of the Company might be sold for taxes long overdue, with the result that the works would be shut down. The Company are at present engaged in the manufacture and sale of gas to the Brookline Gas Company, the Jamaica Plain Gaslight Company, the Dorchester Gaslight Company, the Charlestown Gas and Electric Company, the Chelsea Gaslight Company, and the Dedham and Hyde Park Gas and Electric Company. A scheme of reorganization is in preparation.

Referring to this matter, "Progressive Age" says: "The placing of the New England Gas and Coke Company in a Receiver's hands is just now less a matter of discussion in financial circles than is the proposed plan of reorganization. The most that can be learned concerning this at present is that the Company will be reorganized by New England interests, and that Boston people will own and control the property. Just how much money will be raised has not as yet been definitely determined; but it may be counted as certain that the plan will be sufficiently broad in its scope, not only to provide for the Company's entire indebtedness, but to also furnish ample capital for needed improvements in the plant. It may be added, in this connection, that Mr. Whitney's interest in the enterprise is relatively small, and it is also said by those well informed that the movement for a reorganization has in itself nothing to do with a possible readjustment of the Bay State gas situation, although it is very possible, if not probable, that it will clear the way for the latter, and that in due time the readjustment may cover the whole local gas field."

The Directors of the Buenos Ayres (New) Gas Company, Limited, recommend a dividend of 9s. per share, free of income-tax, for the half year ended Dec. 31 last; making, with the interim dividend already paid, 7 per cent. for the year. The amount which will remain to be carried forward will be £7869.

GAS v. ELECTRICITY IN BRISTOL.

Experiments with Lucas and Keith Lights by the Gas Company.

Some interesting experiments with high-power incandescent gas-lights were carried out on Wednesday night on the premises of the Bristol Gas Company, in the presence of a large number of professional and business members of the City Council.

The visitors assembled in the Board-room, where the Company's Secretary, Mr. J. Phillips, made a few explanatory remarks. He stated that two sorts of lights were exhibited—the Lucas and Keith's. Both were supposed to be of nominally the same candle power—about 700 candles—and were stated to burn from 17 to 20 cubic feet of gas. At the present price of gas, the cost of each light would be rather less than ½d. per hour; it would be a fraction more than this for 1000-candle power. Keith's was high pressure incandescent lighting, and was in use in many places. It had been seen to advantage at the Glasgow Exhibition, and was supplied to the Turin Exhibition. Of course, compressing machinery was necessary. Mr. Phillips described both systems as superior to some well-known forms of incandescent lighting for large buildings, open spaces, &c., and expressed the opinion that electric lighting could not be compared with them. In answer to questions, he added that much longer life than usual was claimed for the mantles. The representative of the Keith and Blackman Company said his firm found the average was a good two months, even where there was a great deal of vibration, such as in factories, workshops, and similar places. Mr. Moss Levy, one of the members of the Bristol Corporation, remarked that it had been stated in a Committee of that body that the Gas Company did not give a price for street lighting, Mr. Phillips replied that they would supply incandescent gas lighting equal to electric lighting at half the cost. The Chairman of the Company (Alderman J. W. S. Dix) said they offered it, and the Corporation would not have it. Mr. Phillips further explained that the gas for either of the lights would cost about £8 a year, while electric lighting would, he believed, come to £21. At any rate, taking an electric light of 2000-candle power, which he understood would cost £21 per annum, the Gas Company could supply an incandescent light, with renewals of mantles, at less than half this figure. He mentioned, too, that there was reason to believe that the cost of mantles for incandescent light, both large and small, would shortly be reduced very considerably, and that those used in private houses would probably come down to 3d. or 4d. each. The visitors afterwards inspected the two lights in different parts of the offices, and very favourable opinions were expressed as to their respective merits. It was generally conceded that they were a revelation in the way of gas lighting. Both were exceedingly bright and steady lights, and indoors, in rather small rooms, were somewhat dazzling. Just before nine o'clock, the visitors had the advantage of seeing one of the Lucas lights burning in the open air, in the Company's yard, on a standard some feet shorter than those used for the electric lights in the streets; and, again, the results were most satisfactory.

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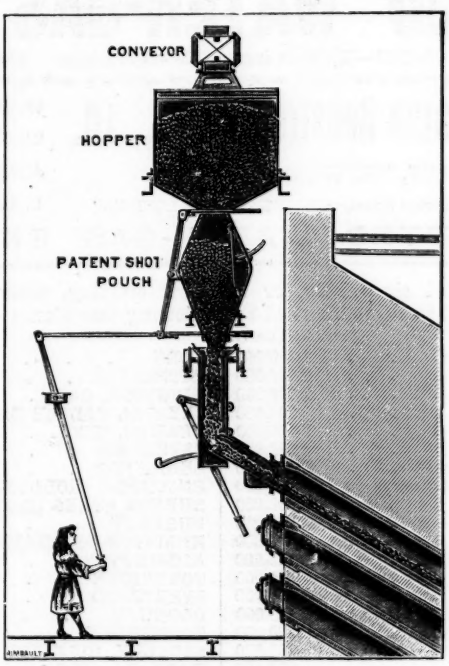

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ELECTRIC LIGHTING NOTES.

Stretford's Requirements.

Colonel A. G. Durnford attended, on behalf of the Local Government Board, at the offices of the Stretford District Council last Friday, to hold an inquiry into an application by the Council for sanction to borrow £54,000 for the purpose of carrying out an electric lighting and traction scheme. A considerable amount of opposition to the proposal was offered by firms in Trafford Park, who contended that, if the Council must establish their own works instead of taking a supply of current from either the Manchester Corporation or the Trafford Power Company, they ought not to embark on so large a scheme until satisfactory evidence was produced that the necessary demand existed to warrant the expenditure. It was, however, stated that Manchester had informed the Council that their offer to supply the district was no longer open.

Estimated Loss at Manchester.

The estimates of the Manchester Corporation Electricity Committee for the current year show a probable expenditure of £175,459 on revenue account, as against anticipated receipts amounting to £166,447—leaving a balance of £9012 as estimated loss, which it is proposed to meet out of the reserve fund. Last year's working on revenue account showed a surplus balance of £6300, which has been carried to the reserve fund. During the twelve months ending March 31, 1903, it is estimated that £875,799 will be expended on capital account, including £21,000 at Dickinson Street, £55,394 at Bloom Street, £463,705 at Stuart Street, £211,295 upon distributing stations, and £119,400 on mains. The estimated loss on the working of the department is brought about principally owing to the enormous expenditure of capital which has been involved during the past year at the Stuart Street works, the twenty odd sub-stations, and in the great number of cables that have been required. In fact, the expenditure of the department on capital account in the past year has been between £700,000 and £800,000, or as much as was spent during the preceding eight years. This great outlay has been necessitated in order to keep faith with the Tramway Committee. On such a vast expenditure a large sum is required to pay interest and sinking fund; the amount in this respect totalling up to no less a sum than £70,000. It is confidently expected that when the next estimates are submitted the department will have so far progressed as not only to present no loss, but to have made a certain amount of profit.

LANCASTER CORPORATION WATER SUPPLY.

Opening of the Blea Tarn Reservoir.

Last Wednesday, the Mayor of Lancaster (Colonel R. T. Hall) brought into use for the first time, with the customary formalities, a new reservoir at Blea Tarn, constructed on a site purchased from the late Sir Thomas Storey. It is required to meet the needs of the rapidly developing communities of Lancaster, Morecambe, Heysham, Hest Bank, and other places on the seaboard. It is less than ten years since the first storage reservoir was opened at Damas Gill. The extreme steadiness of Lancaster's industries has caused a considerable increase of population, and, as a consequence, coupled with the fact of the large number of visitors in summer, a further reservoir has had to be constructed. It covers an area of 23 acres, and is formed by a natural embankment on three sides, and a wall embankment on the south side. The latter, which is 10 feet wide in the centre, and tapers down to 7 feet at each end, is from 16 to 18 feet deep; the clay bottom of this part of the Tarn being found at varying depths—a fact which tended to considerably reduce the expenditure. The north, east, and west banks have been concreted. The valve-tower is situated at the south end of the reservoir, and is connected with the bank by a substantial iron and stone foot-bridge. The shaft of the tower is 56 feet deep from the roof. Provision is made for drawing off the water at three different levels—15, 30, and 45 feet; and all the valves are duplicated. Through the tower access is given to the outlet tunnel, which is 230 yards long, and along which run the 15-inch mains which convey the water to the town. Midway in the tunnel is the straining chamber, fitted with a double set of copper gauze screens, so that continual working may be assured. These thoroughly filter the water before it is carried to the borough. The top-water area of the reservoir is 22 acres, and its storage capacity 120 million gallons, so that it may be anticipated that sufficient provision has now been made for many years to come.

The work was practically initiated on Aug. 26, 1896, when the first turf was cut by Mr. Alderman Huntington, in the dual capacity of Mayor and Chairman of the Water Committee; and the reservoir was actually completed early last year. For something like eighteen months it has been in operation as one of the means of supply; indeed, had it not been for the quantity of water available from Blea Tarn during the long drought of last summer, a good many of the residents in Lancaster would have had reason to lament that means of storage had not previously been provided.

The reservoir itself and the manner in which it has been constructed reflect very high credit not only upon Mr. Alderman Huntington and the members of the Water Committee, but upon the Borough Engineer (Mr. John Cook) and his able assistants. An especially satisfactory and commendatory feature is that the actual cost is considerably less than was originally anticipated. The estimates prepared in 1895 amounted to a little more than £61,000. Powers were, however, obtained to borrow £65,000, in order to provide for contingencies; and so great have been the care and economy exercised, that, without in any way impairing the efficiency of the work, the total cost has not exceeded £52,000—something like £9000 below the estimate.

The Hythe and Sandgate Gas Company have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for new purifying plant on Green's system.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

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	Cubic Feet Daily.
BLACKBURN	1,250,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000
SALTLEY WORKS, BIRMINGHAM	2,000,000
COLCHESTER	300,000
BIRKENHEAD	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000
BURNLEY	1,500,000
KINGSTON-ON-THAMES	1,750,000
ACCRINGTON	500,000
TONBRIDGE	300,000
STRETFORD	500,000
OLDBURY	300,000
TODMORDEN	500,000
SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
YORK (Second Contract)	750,000
ROCHESTER (Second Contract)	500,000
NEWPORT (MON.)	250,000
TOKIO, JAPAN	1,000,000
PERNAMBUCO (Brazil)	125,000
MALTON	150,000
DULUTH, MINN. (Second Contract)	300,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 Cub. Ft. SMETHWICK, 500,000 Cub. Ft. LEICESTER (2nd Cont.) 1,000,000 Cub. Ft.
GRAVESEND, 300,000 C. Ft. BROCKVILLE (ONT.) 250,000 C. Ft. NEWPORT, MON. (2nd Cont.), 250,000 C. Ft.

CARDIFF CORPORATION WATER SUPPLY.

The Reservoir Question.

At a recent Meeting of the Water Committee of the Cardiff Corporation, Mr. J. A. B. Williams and Mr. C. H. Priestley (the Water Engineer to the Corporation) presented a supplemental report on the Cardiff water storage question. The Committee had asked them to report as to what period the proposed construction of No. 3 reservoir might with safety be deferred if certain suggested alterations at Cantreff, Llanishen, and Lisvane were carried out, and the Ely water was utilized to the greatest possible extent for sanitary purposes. They stated that if these alterations, estimated to cost £20,000, were made, the total quantity available for sanitary purposes in an exceptionally dry year like 1887 would be 7¼ million gallons per day. Taking the consumption for all sanitary purposes during a very dry summer at 28 gallons per head per day, this quantity would be sufficient for the population up to the year 1916, when No. 3 reservoir, which ought to be commenced in 1911, might be ready. On a basis of 30 gallons per head per day, No. 3 reservoir would be required in 1912. If a 300,000 gallons per day minimum quantity of Ely water were utilized for sanitary purposes, at an initial cost of £8000 or £9000, there would be a total quantity available of 6,660,000 gallons per day in an exceptionally dry year. These proposals, however, did not allow a margin for any unusual circumstances. If, when the new South Dock was opened, it would lead to a more rapid increase of population, then it would be necessary to commence No. 3 reservoir earlier than 1907. The reporters, in conclusion, explained that the embankment on the Cantreff reservoir might be raised 5 feet, if it were thought advisable. In the course of the discussion of the report, Mr. Veall observed that by its adoption the Committee might defer the expenditure of a quarter of a million. The Chairman (Alderman Jones) said that, in view of the present enormous outlay of the Corporation, this was very desirable in the interest of the ratepayers, if it could be done within the limits of safety. The report was received.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Corporation of Greenock, on Tuesday, at a special meeting held to consider the subject of the completion of Mr. West's scheme of gas-works extensions, agreed to it; but only by a majority of ten votes to seven, and with four members declining to vote. This is not quite satisfactory, as it means that there was a majority of those present who were not prepared to go on with the work. The Gas Committee, as stated last week, recommended that the work be done as suggested by Mr. West, and by his firm.

In speaking to the recommendation, Bailie Campbell, the Convener of the Works Committee, said that the present proposal had its origin in a remit to the Committee in December, to ascertain how the machinery in the gas-works at Inchgreen could best be utilized. The Committee saw that the machinery could not be well utilized, on account of a portion of the retort-house being in a worn-out state. Some of the retorts had been working for several years in that condition—they were, to speak in ecclesiastical language, "aged and infirm." The works were erected about thirty years ago; and he thought the time had surely arrived when they should be subjected to re-classing. They were originally designed to produce a maximum annual output of 300 million cubic feet of gas. This quantity was exceeded last year and the year before; and they might safely say now that the demand had overtaken the supply and exceeded their ability to meet it. The cost of the proposed works was estimated at £13,632—being £7506 for reconstruction and renewals; £1213 for extending the stage-floor; and £4913 for alteration and rearrangement of machinery.

Then followed the peculiar incident of the meeting, in that Bailie M'Neill—while stating that he was satisfied that the work proposed was necessary—expressed his dissatisfaction that such a large sum should be expended without their taking competitive offers. Mr. T. Mitchell—who, if my memory serves me right, was of old time one of the leading lights of the Police Board upon matters relating to the gas supply—moved an amendment which, while agreeing to the projected work in the retort-house, proposed a different arrangement otherwise. He pointed out that as long ago as October, 1899, Mr. S. Stewart, who was then the Gas Manager, drew up a report, in which he showed all the alterations which have been suggested by Mr. W. Ewing, the present Manger, in his report dated Jan. 10 of this year. Mr. Stewart's estimate of the cost was £35,900; and there was not a word in his report of the retorts being in a bad condition. That did not agree with Bailie Campbell's statement that the retorts had been in a deplorable condition for years. He considered that, if the alterations suggested by Mr. West were carried out, they would, instead of increasing the capacity of the works, reduce it. He held that competitive offers should be taken for the work. Ex-Provost Wilson moved that they approve of the scheme drawn up by Mr. West, but that, before entrusting the firm with the work, they take in competitive offers. There was considerable discussion, with some strong language, which I pass over. Then Bailie Campbell pointed out that the major portion of the scheme consisted of the providing of plant for which West's Gas Improvement Company, Limited, held patent rights, and the supply of which is, therefore, in their exclusive control; but there was a considerable portion of the work which that Company intended to offer to local contractors. In all the circumstances, they were practically shut up to adopting the scheme in its entirety, as recommended by Mr. West. Mr. Wilson's amendment was defeated on the first vote; and then the Town Council resolved as stated in my opening paragraph.

The business is therefore settled, and it is to be hoped satisfactorily. It is a pity that it should have been so; but the subject, in its treatment, seems to have been a sort of three-cornered controversy between the supporters of the present and former Managers and Mr. West. Of course, it would never have arisen had the Corporation carried through

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The law of this country—as made clear by the Lord Chief Justice on the 8th of October, 1901, when he refused an application of the Welsbach Company for an injunction—is: The holder of a patent has as much right to trade as the holder of another patent, and neither has the preferential privilege to declare the other's patent invalid or an infringement, nor must they threaten their respective customers until the claim of infringement has been made good in a court of law.

The Court of Appeal, to whom the Welsbach Company carried the above case, confirmed the finding and judgment of the Lord Chief Justice on the 11th of November, 1901.

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the recommendations of Mr. West, as originally made. It will be observed that the total cost now is about £14,000. Very recently it was stated in the Town Council that the amount might run up to £25,000. That remark betokens a spirit of hesitancy on the part of the Corporation to spend money, which has been at the bottom of all the present trouble. There is, it must be admitted, some reason for such a feeling in Greenock; for the town has been hit severely in two matters in recent years—in the collapse of the sugar industry, and in the loss upon the James Watt Dock. Both of these have been got over; and the town is now in a more hopeful position, which everyone is glad to see. Of course, to starve the gas-works was not the way to bring back prosperity. That is what was attempted, and was, in fact, the policy which was adopted at the time of the last alterations. The policy has now, happily, been abandoned. There can be no doubt that the experience of the future will justify the new departure. It would have been more hopeful if there had been unanimity upon the subject; but Mr. Ewing's working of the new plant should soon convince the waverers that the best possible step has been taken.

Some time ago the Brechin Town Council ordered a road-roller to be put over the streets after an Electric Lighting Company had laid down their cables in the town. The tracks where the cables were laid were very loosely filled in, with the result that great havoc was played with the gas mains and services. Mr. Allan Reid, the Gas Manager, at once communicated with the Town Clerk, intimating that, unless the roller was stopped at once, the Town Council would be held liable for damages. This had the desired effect; but, all the same, the damage caused was considerable. A claim was made by the Brechin Gas Company against the Council for £30. They denied liability, and handed over the claim to the Electric Lighting Company. A settlement has now been come to—the Company agreeing to pay £20, and the Council £5.

It is occasionally one's duty to record that a gas company has been dissolved. Happily the event is rare; and when it does take place, it is always after long service, and on account of local changes in the industry, or in the population. I never heard of a gas company going down after an existence of only seven years. It falls to my lot this week to chronicle the demise of an electric lighting venture of that age. The place is Cults, a suburb of Aberdeen. The undertaking was started by a gentleman of the name of Anderson, who sold it to a Company, and the Company has gone into liquidation. There was a bond for £2000 over the property, which the Liquidators were unable to meet, and they handed over the works to the bondholders—the Town and County Bank. Bankers are everywhere matter-of-fact people; and in this instance, resolving to lose no more than they could help, by the running of an unprofitable adventure, they promptly intimated that the light was to be cut off. The process of cutting off took place a week ago. An attempt was made to get a company floated for the purpose of carrying on the lighting, but it failed. The proposal was to pay £2250 for the existing works, and to expend about another £2000 upon them. In order to raise the capital, it was stated that it would be necessary for consumers to take a £1 share for every three units of electricity they required. This was more than consumers could afford. It was virtually adding 3d. or 4d. to the cost of the unit of light. They have consequently returned to the use of oil for lighting. Evidently without a hot-house period of propagation in its youth, it is difficult to get an electric light undertaking to strike—commercially.

It is reported that the Town Council of Perth have sold a portion of the site of the old gas-works in Scott Street to the City of Perth Co-operative Society, at a good price. The Society's headquarters are in the vicinity. They propose to erect shops upon the ground.

The Clyde Lighthouses Board have this week applied to the Gourock Corporation for a supply of gas from the Corporation gas-works for the Clock Lighthouse, which guards what is, in effect, the entrance to the River Clyde. The Corporation resolved to give the supply upon condition that the Lighthouse Board pay for twenty years a sum equal to 7½ per cent. yearly of the cost of laying the main which will be necessary, and also pay for the gas consumed at the same rate as is charged to consumers within the burgh. The conditions seem to be quite reasonable.

There is unabated activity in the propaganda of the Gas Workers and General Labourers' Union in Scotland, but mostly in the towns which are not of the first rank. A meeting under the auspices of the Union was held in Dundee on Friday of last week, the purpose of which was to improve the organization in the city. It is reported that there was a large attendance. The Chairman (Mr. James Mann) said he thought that those who were called—perhaps miscalled—unskilled labourers should seriously consider the question of organization, because the unskilled labour market was often encroached upon by skilled workers, who could not get employment at their own trades. This is but another way of saying that a first-class passenger may ride in a third-class carriage, but a third-class passenger may not ride in a first-class carriage until he qualifies himself for so doing. It is the same all over the world; and I am afraid that no amount of organization on the part of the third-class passengers would avail to stop the practice. But the sentiment expressed by the Chairman illustrates, in a manner perhaps more forcible than he intended, the class animosities which Trade Unionists are prepared to foster—upon which, in fact, they live, and which it ought to be the aim of every right-thinking person to endeavour to keep under, rather than to encourage. Mr. J. Carruthers said he was a Socialist as well as a Trade Unionist; the principles of the two were not divergent, as the Trade Unionist must be a Socialist, or he could not be a true Trade Unionist.

What nonsense this remark is. The Trade Unionist is a Socialist so far as capital is concerned; but when it comes to labour, he is notoriously a protectionist of the most pronounced type. Mr. Carruthers unwittingly proved this by his subsequent remark that unjust dismissals could be prevented by organization, and his appeal to all to look at the matter from an unselfish point of view, and to combine, if not for their own sakes, at least for the sake of their fellow-workers. That is to say, the men are called upon to be unselfish; but their unselfishness is not to extend beyond their own class—outside of it their attitude is to be

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of the preventive, or, in other words, coercive, order. Mr. W. Blackwood, the Organizing Secretary in Scotland, stated that they had now four branches of the Union in Dundee, with a total membership of about 400. Mr. S. J. Meads, of Glasgow, stated that five sixths of the produce of labour goes to the capitalists; and he pointed to that as a proof of the necessity for organization if workers were to secure a fair share of the fruits of their labour.

There was, of course, no proof of Mr. Meads' statement, and with reference to it I would say that the determination of the proportion of profit which goes to the one side, or the other, depends upon where it is agreed that profit begins. I am afraid that many capitalists will be disposed to say that when all capital charges and oncosts have been met, it will be found that the workers' share of the profits are larger than theirs. Take the case of a man employing ten men at 30s. a week each. He will pay his workers £780 a year. How many employers with a staff of ten men are able to make a net profit of £780 a year? These considerations only show how loose and unsubstantial are the arguments which are used in the so-called promotion of the cause of labour. When thus analyzed, it is seen that it is not labour which is sought to be promoted, but the art of earning wages without labour—a very different thing.

As to the number of men enrolled in Dundee, I have pointed out before, and I repeat, that it must not be taken that they are all gas-workers. Indeed, from the fact that there are four branches, it is safe to say that they belong to different classes of work, and the presumption may be hazarded that there are few gas workers among them.

The final statutory meeting of the Newport (Fife) Gaslight Company, which has been taken over by the Town Council at the price of £10,500, was held on Thursday. The accounts of the Liquidator of the Company were submitted. They showed repayments to the shareholders at the rate of £1 13s. 4d. per £1 share. The accounts were approved; and the Liquidator was instructed to retain the books, accounts, and documents belonging to the Company, with authority to destroy them at the end of five years. The Company has been in existence for nearly fifty years. Of the 92 original subscribers, four still survive. The original capital was only £1300; and the price of gas was 12s. 6d. per 1000 cubic feet. The Company was formally wound up by resolution; and the final item of business at the meeting was the passing of a vote of thanks for his services to the Chairman—Mr. John Donaldson.

The construction of the branch railway to the proposed site of the new Corporation gas-works at Falkirk is not yet assured, although there does not seem to be much reason to fear that the project will now go amiss. At a meeting of the Corporation on Monday, a letter from the General Manager of the North British Railway Company was read, in which it was stated that there did not seem to be much likelihood of the Railway Company being able to come to a private agreement with proprietors of land, and that therefore it would be necessary to obtain powers before the line could be constructed. The point of this communication is that time will be lost, and that the gas-works, which are sorely needed, may not be got to work so soon as is desired. The proposal is made that the railway should be constructed, and the powers obtained afterwards. But the difficulty there is that the affair is more that of the Railway Company than of the town, although it is more the interest of the town than the Company, and that the Company may not see it to be their duty to run the risk of having to pay higher prices for having forestalled the Legislature. The Company will likely desire to have as free a hand as possible; and this forms the weakness of the position for the Corporation. The matter was continued for adjustment with the Company. Progress might, of course, be made if the Corporation were to endeavour to adjust the difference with the proprietors; but that would cost a good deal, and the Corporation are naturally anxious to have their gas-works at as little cost as possible. The Company are on the same tack; and thus the deadlock arises.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April* 26.

Sulphate of Ammonia.

The market has continued to harden; and the closing quotations are £12 2s. 6d. per ton f.o.b. Hull, and £12 3s. 9d. to £12 5s. f.o.b. Liverpool and Leith. Demand has been mainly for immediate delivery; and in the case of urgent orders, extreme prices have been paid. There has also been good inquiry for early May delivery; but, in this position, buyers have been unwilling to pay quite the level of spot prices, hoping that when April requirements are covered the market may become easier. But it is doubtful whether all April contracts will be covered within the month, and if they are, there will only be the limited May production available for May requirements—there being no stocks anywhere. The firm spot market has revived interest in the forward position, and purchases have been made at the advanced prices demanded by makers. £11 15s. per ton is reported to have been paid for May-October delivery f.o.b. Leith, ordinary terms. London is firm at £11 15s. per ton, Beckton terms, for June-September delivery.

Nitrate of Soda.

This article has, owing to arrivals, given way; and the spot price for fine quality is now 10s. 4½d. per cwt.

LONDON, *April* 26.

Tar Products.

The markets generally are quiet, and, with the exception of pitch, there does not appear to be much doing in any of the products. The inquiry for pitch continues strong, especially for prompt delivery; and very high prices are reported to have been paid for immediate shipment at outports. In crude carbolic, further business has been done at 1s. 11d. for 60's, April-September; but a sale is reported at something under this for July-December at an outport. As regards crystals, the position is unchanged. There is an absence of demand, especially

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for 39-40's. Transactions in benzol are very limited indeed; and, so far as the aniline trade is concerned, there does not seem to be any demand. The position of solvent and toluol remains unchanged; and it is very difficult to fix the actual price at which business could be arranged. Creosote is quiet; but there is no alteration to report. There are several parcels offering in various quarters at rather low prices; and it would appear as if stocks had begun to accumulate in certain districts. The London market is scarcely so firm; and it is reported that 1¼d. would be accepted by some of the smaller makers. The demand for pyridine continues very strong, and prices show a decided improvement.

The average values during the week were: Tar, 15s. 6d. to 20s. 6d. Pitch, London, 42s. to 42s. 6d.; east coast, 40s. 6d.; west coast, 37s. to 37s. 6d. Benzol, 90 per cent., 8½d.; 50-90 per cent., 7½d. Toluol, 9d. Crude naphtha, 3d.; solvent naphtha, 9½d. to 10d.; heavy naphtha, 9d. to 10d. Creosote, London, 1¼d.; North, 1d. Heavy oils, 1⅞d. to 2d. Carbolic acid, 60 per cent., 1s. 11d. Naphthalene, 35s. to 45s.; salts, 21s. 6d. to 23s. 6d. Anthracene, "A," 1½d. to 1¾d.; "B," 1d. nominal.

Sulphate of Ammonia.

The market is very firm indeed, and the demand for prompt shipment is very strong; while a considerable business is doing forward. The Gaslight and Coke Company quote £12 for delivery in June, but would accept £11 17s. 6d. for June-September; while for July-December, £11 15s. is the market quotation. The Hull market is very firm, and £12 has again been paid for prompt; but there is no forward business to report. As regards Leith, business was done early in the week at £11 13s. 9d., and later at £11 15s., May-October shipment, for what is generally considered to be the finest Scotch make; while £11 12s. 6d. was declined for ordinary quality, May-December delivery. The demand for shipment from Liverpool is very strong; and it is reported that as much as £12 6s. 3d. has recently been paid, although earlier in the week £12 5s. was accepted.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Although nothing in the way of any definite announcement has been made with regard to prices, the question of a reduction with the close of the present month has been under consideration; and there are very general anticipations that, with the 1st of May, some modification of the present list basis rates will come into operation. The renewal of the gas coal and locomotive fuel contracts has also again occupied attention during the past week; and it would seem more than probable that the basis upon which contracts for the ensuing twelve months will have to be accepted may be considerably lower than was at first anticipated. It is reported that the Salford Corporation have been able to place contracts for the ensuing year at from 1s. 6d. to 1s. 8d. below the rates that were paid in 1901. These particular contracts may, of course, represent some special conditions; but it appears now to be anticipated that at any rate 1s. to 1s. 6d. will have to be conceded on last year's rates, the basis being, of course, regulated according to quantities and other circumstances. With regard to locomotive fuel, the principal railway companies are holding back from renewing contracts, except at a reduction of 1s. per ton on last year's prices. A further meeting of Lancashire coalowners has been held, at which a general determination was expressed not to give way more than 6d. per ton. In the meantime, however, it is reported that companies have been settling contracts at 8s. to 8s. 3d. at the pit—representing reductions of 9d. to 1s. on last year's rates. In house-fire descriptions, there is still a very fair trade doing; and in the better qualities, collieries for the most part are moving away their output, with little or nothing of moment going into stock. The medium and lower descriptions of round coal are, however, not meeting with so ready a sale, either for common house-fire or steam and forge requirements; and there is an increasing pressure with surplus supplies coming in from other districts, which will no doubt largely influence local collieries as to the action they may take with regard to prices with the close of the month. For the present, the basis quoted rates remain at 15s. to 15s. 6d. per ton for best Wigan Arley, 13s. to 13s. 6d. for Pemberton four feet and seconds Arley, 11s. to 11s. 6d. for common house coal, and 8s. 6d. to 9s. for steam and forge coals, at the pit. The best qualities of engine fuel continue in fairly good request; and for these, prices have been well maintained at about 6s. 6d. to 7s. per ton at the pit. Inferior sorts of slack, however, are becoming rather a drug; and special lots are offering on the market at very low figures, which gives a weak and irregular tone to prices in the open market. Slack is offering in outside districts from 2s. 6d. to 3s. 6d. per ton at the pit, with common Lancashire slack about 4s. 6d. to 5s. Shipping remains quiet, with prices easier—9s. 6d. to 10s. being taken for ordinary descriptions of steam coal, delivered at the Mersey ports. For coke, a steady demand is still reported generally, and prices are maintained at late rates, averaging 22s. to 24s. for best Lancashire foundry and 13s. 6d. to 14s. for best washed furnace cokes, 13s. 6d. for best Yorkshire washed furnace, and 11s. 6d. to 12s. for common furnace cokes, at the ovens.

Northern Coal Trade.

The coal trade has been weaker in the last few days; the home demand not being so great, while the late opening of the Baltic ports keeps the export trade less than it would otherwise have been. The dulness is felt in most classes of coal. In the Northumbrian steam coal trade, best qualities are quiet at 11s. per ton f.o.b., second-class coals are very dull at from 9s. 3d. to 9s. 9d., and steam smalls are from 5s. 6d to 5s. 9d., with a moderate demand, though with fuller forward inquiries. In the gas coal trade, there is now a considerable declension in the home demand, and as the foreign inquiry is not yet as full as is common, some of the collieries have been laid idle. Prices are easier for occasional cargoes—from 8s. 6d. to 9s. 3d. per ton f.o.b., according to quality, being the current quotation for Durham gas coal. Nothing more seems to have been done as to the remaining large contracts for gas coals for the south. The coke trade is on the whole

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fairly firm. Best Durham coke for export is from 17s. to 17s. 6d. per ton, f.o.b., blast-furnace coke is about 15s. to 15s. 3d. per ton at the Teesside furnaces; and gas coke (if a little less plentiful) is on the same line of prices as a week ago.

Scotch Coal Trade.

The coal trade has not yet received the impetus of the Baltic trade; it being reported that it will likely be four weeks yet ere the upper ports are free of ice. There is a good demand for home consumption; and for ell there is quite a satisfactory outlet abroad. Prices cannot be said to have moved, and may be given (per ton f.o.b. Glasgow) at: Main, 8s. 3d. to 8s. 6d.; ell, 9s. 6d. to 10s. 3d.; splint, 9s. 3d. to 9s. 6d. The shipments for the week amounted to 189,537 tons—an increase upon the preceding week of 5775 tons, but a decrease upon the corresponding week of last year of 2748 tons. For the year to date, the total shipments have been 2,749,357 tons—an increase upon the same period of last year of 283,140 tons.

Loss on the Heywood Gas-Works.—Mr. W. Whatmough, the Gas Manager to the Heywood Corporation, reports that there has been a loss on the working for the year of £299. He explains that the increased cost of coal, the low price of residuals, and the increased charge for interest and rates and taxes are the principal causes of the loss. For several years £1000 has been handed over from the gas profits in relief of the rates.

Stafford Water Supply.—The annual report of the Stafford Corporation Water Committee states that the income for the past twelve months was £4998, or an increase of £170 on the previous year. The expenditure, including £463 carried to depreciation fund, amounted to £2278, or a decrease of £147. The gross profit was £2720, or an increase of £317. After making provision for the repayment of loans and the payment of interest, and placing £150 to reserve fund, there was an available balance of £648, out of which a sum of £600 has been transferred to the district fund in reduction of the rates.

Aberavon New Gas-Works.—The amended estimate for the proposed new Gas-Works at Aberavon now exceeds £15,500, and the Town Council have decided to make the necessary application to the Local Government Board at once for this amount. Contracts Nos. 3 and 4 have now been let, and Nos. 5 and 6 are awaiting the approval of the tender by the Engineers.

An exhibition of gas appliances was held in the City Hall, Perth, last week, under the patronage of the Town Council. Lord Provost M'Gregor opened it on Tuesday. Miss H. M. Young was the lecturer.

The James Keith and Blackman Company, Limited, inform us that three of their No. 3 gas compressors are being used by the Welsbach Company at the Newcastle Exhibition. They have also just sent off six compressors of the same size to San Paulo.

Messrs. R. & A. Main, Limited, have just completed successful exhibitions, combined with free cookery lectures, in the undernoted towns: Darwen, with lectures by Mrs. H. C. Gray; Alloa, with lectures by Miss E. M. Dods; Rothesay, with lectures by Miss M. Baines; and Nairn, with the co-operation of Miss S. Y. Young.

Judging by the number of repeat orders which they have in hand at the present time, the water-gas installations of the Economical Gas Apparatus Construction Company, Limited, must be giving considerable satisfaction to those by whom they are owned. The Company have just received a second contract for a plant at Newport (Mon.) to manufacture 250,000 cubic feet of water gas per day.

Messrs. Joseph Taylor and Co., of Bolton, have received an order for two solid plate lead circular self-emptying saturators, and one plate lead evaporating pan, 1 inch thick, from Messrs. Major and Co., Limited, of Wolverhampton and Hull, for their Sculcoates works. They have also been instructed by the Malton Gas Company to alter their present saturator into one with double detachable ammonia pipes, of the latest make.

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MANCHESTER CORPORATION GAS-WORKS.

WANTED, for the Bradford Road Gas-Works, a FOREMAN MECHANIC. Candidates must have a thorough knowledge of Stoking Machinery, Locomotives, &c., and must be accustomed to the control of Workmen. Age not to exceed 45 years Commencing Wages, Three Guineas per week.

Sealed applications, endorsed "Foreman Mechanic," stating Age and Experience, and enclosing not more than Three recent Testimonials, must be addressed to the Chairman, of the Gas Committee, and delivered at the Gas Office, Town Hall, Manchester, not later than Ten a.m. on Saturday, May 10, 1902.

By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
April 24, 1902.

DERWENT VALLEY WATER BOARD.

APPOINTMENT OF ASSISTANT ENGINEER.

BY the Derwent Valley Water Act, 1899, the Derwent Valley Water Board is authorized to construct Six large RESERVOIRS in the Valleys of the Derwent and the Ashop, in Derbyshire, together with important subsidiary Works in connection therewith to deal with an estimated flow of Fifty Million Gallons of Water per day. The Reservoirs will be constructed successively, and the execution of these and the other authorized Works is expected to occupy many Years.

Applications are now desired for the position of ASSISTANT-ENGINEER to the Board, who will be required to reside in the neighbourhood of the Works and under the supervision and direction of the Engineer, to devote the whole of his time to his duties under the Board. (The present Engineer is Mr. Edward Sandeman).

It is indispensable that Candidates for the appointment should have had considerable experience in designing and constructing Reservoirs and Gravitation Water-Works.

Each Applicant must furnish at least Two References and *copies* of Testimonials (which cannot be returned), the Board having the right to call for the production of the originals.

Applications, on the printed Form to be obtained at my Office, stating Age, Experience, present position, Salary required, when at liberty, and general state of health, to be sent to me not later than the 6th day of May, 1902, endorsed "Assistant Engineer."

Personal canvassing will be a disqualification.

JAMES BELL,
Solicitor and Clerk to the Board.

Rowton Buildings, Bowling Green Street,
Leicester, April 7, 1902.

STATION Meter wanted, 35,000 cubic feet per hour, Second-hand, and in perfect order. Address Gas-Works, Gothenburg, SWEDEN.

WANTED to Purchase, a Second-Hand CAST-IRON SCRUBBER, about 4 feet in diameter.

Send full Particulars and lowest Price free on rail to Mr. S. DAWES, Homedale, CLEVEDON.

REQUIRED, a Second-Hand 20,000 Cubic Feet per hour STATION METER, in good condition.

Reply to No. 3857, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CARBON for Sale.—About 8 Tons at Smethwick Gas-Works.

Offers to W. J. STURGES, Secretary, Town Hall, SMETHWICK.

FOR SALE—Gas Journals for 1896, 1898, 1899, 1900, and 1901 complete. OFFERS WANTED.

Write 120, WEST END AVENUE, HARROGATE.

TO BE SOLD—

10-inch SCRUBBER-WASHER, by Clapham, overhauled and perfect.

12-inch SCRUBBER-WASHER, by Holmes, overhauled and perfect.

FIRTH BLAKELEY, DEWSBURY.

CONDENSER for Sale—Morris and CUTLER'S "PERFECT;" capacity 250,000 cubic feet per 24 hours. In perfect condition. New in 1888, and recently retubed.

Apply to A. E. LAYTON, Manager, Gas-Works, REDDITCH.

STATION METER FOR SALE.

ROUND Station Meter by Alder and Mackay, 3600 Cubic Feet per hour; 6-inch Connections. As good as new. Only in use Two Seasons for an Oil Enrichment Process.

Apply ALLAN REID, Manager, Gas-Works, BRECHIN, N.B.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

TO BE SOLD—

GASHOLDER, Two-Lift 45 ft. by 14 ft. = 42,000 cubic feet capacity.

CENTRE-VALVE, 15 in. diameter, by Walker, for Four Purifiers.

Four PURIFIERS, 10 feet square, in line, with Planed Joints, Walker Centre-Valve, Covers, and Traversing Crab Lifting Gear. Will be refixed equal to new.

Write J. WRIGHT, Bridge House, BLACKFRIARS, E.C.

SPECIAL OFFER of Gas Purifiers.

Six Perfect 20 feet Square PURIFIERS, planed Joints, Lutes 2 feet deep, made to Newbigging's Specification. Bargain to early Purchasers.

FIRTH BLAKELEY, DEWSBURY.

FOR SALE—

Anderson's WASHER and FOUR-BRUSH SCRUBBER.

Good's WASHER.

STATION METER, Rectangular (capacity, about 12,000 cubic feet per hour).

All the above with 10 inch Connections.

Apply to,
THOMAS PRICE,
Engineer and Manager.

Gas-Works, Walton-on-Thames.

GAS PLANT for Sale of all kinds.

GASHOLDERS, 15 ft. to 50 ft. diameter.

Iron or Steel TANKS for ditto.

SCRUBBERS AND WASHERS, by Holmes, Clapham, &c.

CONDENSERS—Pipe, Annular, and Patent Condensers

PURIFIERS, from 4 ft. to 20 ft. square.

RETORT-FITTINGS, METERS, GOVERNORS, VALVES, &c.

Every Description of NEW PLANT supplied.

FIRTH BLAKELEY AND CO., Gas Engineers, DEWSBURY.

TENDERS FOR GAS COAL.

THE Directors of the Westerham Gas and Coke Company, Limited, invite TENDERS for the supply of about 500 to 600 tons of best screened GAS COAL, to be delivered to Westerham Station, in quantities of 50 Tons at the time, to suit the convenience of the Directors during the ensuing Year.

Tenders, endorsed "Tender for Coal," to be sent in by May 7, 1902.

The Directors do not bind themselves to accept the lowest or any Tender.

By order of the Directors,
C. W. HOOKER,
Secretary.

Westerham.

ROMFORD GAS AND COKE COMPANY, LTD.

TENDERS are invited for the supply of 4500 tons of GAS COALS, to be delivered free at Romford Station, G.E.R., during One Year commencing July 1, 1902.

Sealed Tenders, endorsed "Coals," and addressed to the Chairman of the Gas Company, are to be sent in before Saturday, the 3rd of May next.

Schedule of Deliveries may be obtained on application to

W. D. CHILD,
Manager.

Gas Office, Nursery Walk, Romford, Essex.

DENTON URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

TAR.

THE Gas Committee invite Tenders for TAR, the same to be sent in on or before the 7th of May.

Particulars may be obtained from the Gas Engineer, Mr. J. Chadwick Smith, Gas-Works, Denton, near Manchester.

The Committee do not bind themselves to accept the highest or any Tender.

By order,
WILLIAM RICHARDS,
Clerk of the Council.

April 22, 1902.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Leek Urban District Council in- vite TENDERS for the supply of best Washed NUTS or BEANS, also of CANNEL NUTS, for the Year commencing the 1st of July, 1902, to be delivered at Leek Station on the North Staffordshire Railway.

Further Particulars and Forms of Tender may be obtained from the undersigned.

Sealed and endorsed Tenders, addressed to the Chairman of the Gas Committee, to be delivered at the Town Hall, Leek, not later than Friday, the 2nd of May, 1902.

By order,
C. HENSHAW,
Clerk.

Town Hall, Leek,
April 19, 1902.

TENDERS FOR GAS COALS.

THE Directors of the Watford Gas and Coke Company invite TENDERS for the supply of GAS COALS, screened or unscreened, to be delivered at the Bushey Station of the London and North-Western Railway as follows—viz.,

For 10,500 Tons (more or less), to be delivered between the 1st of July, 1902, and the 30th of June, 1903.

Or for 21,000 Tons (more or less), to be delivered between the 1st of July, 1902, and the 30th of June, 1904.

Or for 31,500 Tons (more or less), to be delivered between the 1st of July, 1902, and the 30th of June, 1905.

Forms of Tender and all Information may be obtained, on application in writing only, of me the undersigned.

Tenders to be delivered on or before the 6th day of May, 1902, addressed to the Chairman of the Watford Gas and Coke Company, Watford, endorsed "Tender for Gas Coal."

Tenders must be on the form supplied, any alteration of which will invalidate the Tender.

The Directors do not bind themselves to accept the lowest or any Tender.

J. DUNCAN ROYAL,
Secretary.

Watford Gas and Coke Company's Offices,
Watford, April 15, 1902.

TENDERS FOR GAS COAL.

THE Brentwood Gas, Coke, and Light Company, Limited, are prepared to receive TENDERS for the supply of 5300 Tons of good, clean, fresh worked GAS COAL, screened and unscreened, for the Year ending April 30, 1903. Deliveries to be free at Brentwood Station (G.E.R.) in quantities to be subsequently determined.

Not less than 2000 Tons of any one description of Coal will be taken.

No Form of Tender issued.

Tenders to be delivered to the undersigned on or before Friday, May 2 next.

The lowest or any Tender not necessarily accepted.

C. A. FIELDER,
Secretary.

Brentwood, Essex,
April 17, 1902.

PONTYPRIDD URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply and delivery of CAST-IRON MAINS.

Specifications, Quantities, and Form of Tender may be obtained from Mr. Edward Jones, Gas Engineer, Treforest.

Sealed Tenders, marked "Cast-Iron Mains," to be delivered to the undersigned on or before May 19, 1902.

No Tender necessarily accepted.

By order,
C. SYDNEY WATSON,
Clerk.

Council Chambers, Pontypridd,
April 25, 1902.

CROMER, NORFOLK.

TENDERS FOR COAL.

THE Directors of the Cromer Gas Com- pany are prepared to receive TENDERS from Colliery Proprietors only, for the supply of from 2500 to 3000 Tons of first-class GAS COAL, to be delivered at the Company's Siding, Midland and Great Northern Railway Station, Cromer, between the 1st of July next and the 30th of June, 1903. Weight given to be stated.

Deliveries to be made in such quantities and at such times as may be required by the Company.

Payment, net cash monthly.

Sealed Tenders, endorsed, "Tender for Coal," to be sent to the undersigned on or before the 12th day of May next.

Forms of Tender are not supplied.

The Directors do not bind themselves to accept the lowest or any Tender.

By order,
P. E. HANSELL,
Secretary.

Cromer, April 26, 1902.

WALLASEY URBAN DISTRICT COUNCIL.

(GAS, WATER, AND ELECTRICITY DEPARTMENT.)

COAL CONTRACTS.

THE Wallasey Urban District Council are prepared to receive TENDERS to supply, over a period of One, Two, or Three Years from the 30th of June next, 7000 Tons of ROUND CANNEL and 23,000 Tons of Screened GAS COAL for their Gas-Works, delivered in railway waggons as per Specification, copy of which, together with any further Information, can be obtained on application to the Engineer, Mr. J. H. Crowther, at his Office, Great Float, near Birkenhead.

Sealed tenders, on contractor's own form, endorsed "Tender for Gas Coal and Cannel," to be delivered at my Office, as below, not later than Thursday morning, the 15th of May, 1902.

The contractor will be required to enter into a bond, with approved sureties, for the due performance of the contract.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
H. W. COOK,
Clerk and Solicitor to the Council.

Public Offices, Egremont, Cheshire,
April 25, 1902.

WALLASEY URBAN DISTRICT COUNCIL.

(GAS, WATER, AND ELECTRICITY DEPARTMENT.)

CONTRACTS FOR STORES.

THE Wallasey Urban District Council are prepared to receive TENDERS to supply, over a period of Twelve Months from the 30th of June next, the following among other Articles, being the principal Stores required at the Gas, Water, and Electric Supply Works, viz.:—

Stop Cocks and Main Taps.	Lead Pipe.
Ferrules.	Wrought-Iron Pipes.
Fire Bricks and Retorts.	Cast-Iron Pipes.
Shovels.	Cotton Waste.
Iron and Steel.	Gas, Water, and Electricity Meters.
Oils and Paints.	Lamp - Columns and Lamps.
Street Boxes.	Bolts and Nuts.
Sluice Valves and Hydrants.	Cables.

Further Particulars, with Forms of Tender, may be had on application to the Engineer, Mr. J. H. Crowther, at his Office, Great Float, near Birkenhead.

Samples may be inspected at the Gas and Water Stores, Great Float, and at the Electricity Stores, Seaview Road, Liscard.

Sealed Tenders, on the form embodied in the specification, endorsed "Tender for Gas, Water, and Electricity Stores," to be delivered at my Office, per post, not later than Thursday morning, the 15th of May, 1902.

The contractor will be required to enter into a bond, with approved sureties, for the due performance of the contract.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
H. W. COOK,
Clerk and Solicitor to the Council.

Public Offices, Egremont, Cheshire,
April 25, 1902.

TO IRONFOUNDERS AND OTHERS.

THE Leek Urban District Council invite TENDERS for the following CAST-IRON PIPES, Turned and Bored:

440 Yards of 12-inch,
216 ,, 10-inch,
240 ,, 8-inch,
270 ,, 4-inch.

Further Particulars may be obtained from the undersigned.

Sealed and endorsed Tenders, addressed to the Chairman of the Gas Committee, to be delivered at the Town Hall, Leek, not later than Friday, the 2nd of May, 1902.

By order,
C. HENSHAW,
Clerk.

Town Hall, Leek,
April 19, 1902.

CANTERBURY GAS AND WATER COMPANY.

TENDERS FOR GAS COALS.

TENDERS are invited for the supply of 16,500 tons of the best GAS COALS, to be delivered during One Year, commencing on the 1st of June next.

Forms of Tender, containing Particulars and Conditions of the Contract, may be obtained on application to the undersigned.

Sealed Tenders, endorsed "Coals," to be delivered at the Company's Offices, Castle Street, Canterbury, on or before Saturday, the 3rd of May next.

By order,
JAMES BURCH,
Secretary and General Manager.

April 14, 1902.

BOROUGH OF BARROW-IN-FURNESS.

SUPPLY OF COAL AND CANNEL.

THE Corporation are prepared to receive TENDERS, on Forms to be obtained at the Office of the Gas and Water Manager, for the supply of screened GAS COAL and CANNEL, for the Year ending the 30th of June, 1903.

Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Coal," to be delivered at the Town Clerk's Office not later than Twelve o'clock noon, on Wednesday, the 7th day of May, 1902.

The lowest or any Tender not necessarily accepted.

By order,
C. F. PRESTON,
Town Clerk.

Town Clerk's Office, Town Hall,
Barrow-in-Furness, April 15, 1902.

By order of the Directors of the

CROYDON COMMERCIAL GAS AND COKE COMPANY.

HOOKER & WEBB will sell by Auction, at the Greyhound Hotel, Croydon, on Thursday, the 29th of May, 1902, at Six o'clock precisely, in large and small lots,

£5000 CONSOLIDATED "C" ORDINARY STOCK
OF THE
CROYDON COMMERCIAL GAS AND COKE COMPANY,

which for some years has paid Dividends of 9 per cent. per annum, and since 1898 these have been paid free of Income-Tax.

Particulars and Conditions of Sale may be had of the SECRETARY of the Company, Katharine Street, Croydon; and of the Auctioneers, 4, High Street, Croydon.

Telphone No.: 122 Croydon.

SOUTH STAFFORDSHIRE WATER-WORKS COMPANY.

ISSUE OF £10,000 ORDINARY STOCK, CLASS "B," BY PUBLIC TENDER.

THE Directors Hereby Give Notice, that, in accordance with the Provisions of the South Staffordshire Water-Works Order, 1901, they are prepared to issue the above-mentioned amount of NEW ORDINARY STOCK, in lots of £100 each.

The New Ordinary Stock will rank for dividend with the existing Ordinary Stock of the Company, on which Dividends are limited to Seven per Cent. per annum; and the Holders will have the same privileges as to Voting and Qualification.

Tenders may be made for any number of lots.

The existing Ordinary "B" Stock was quoted on the Birmingham Stock Exchange, April 22, 1902, at £155 to £160 per cent.

The Dividend paid for the Half Year ending Dec. 31, 1901, was at the rate of 6 per cent. The Average Dividend paid during the last five years on the Ordinary Stock has been at the rate of £5 18s. per cent.

Forms of Tender may be obtained on application to the Secretary, at the Office of the Company, in Paradise Street, Birmingham, on and after Thursday, the 24th day of April, 1902; and the latest day for receipt of Tenders is fixed for Friday, the 23rd day of May, 1902.

Notices of Allotment will be sent out by the Company on or before Monday, the 26th day of May, 1902; and the date for payment of the whole amount of the Stock and Premium to the Company's Bankers is fixed for Monday, the 30th day of June, 1902, after which day the Stock will rank for Dividend.

The Allotments will be made, and Certificates will subsequently be issued, free of all expense to the allottees, who will thus acquire the Stock without payment for Stamps, Commission, or Fees of any kind.

G. J. SPARROW,
Secretary.

Paradise Street, Birmingham,
April 23, 1902.

PRESTON GAS COMPANY.

THE Directors of the Preston Gas Company invite TENDERS for the supply of CANNEL and GAS COAL for One, Three, or Five Years, from the 1st of July next.

For Particulars, apply to the undersigned.

Sealed Tenders, endorsed "Tender for Coal, &c.," and addressed to the Chairman of the Company, must be received not later than Saturday, the 10th of May, 1902.

HENRY GREEN,
Engineer.

Preston, April 22, 1902.

BOROUGH OF PORTSMOUTH WATER-WORKS COMPANY.

NOTICE OF HALF-YEARLY MEETING.

NOTICE is Hereby Given, that the next HALF-YEARLY MEETING of the Shareholders in this Company will be held at the Company's Offices, Commercial Road, Portsmouth, on Thursday, the 22nd day of May, 1902, at Three o'clock in the afternoon, on the following Business: To receive the Accounts and Balance-Sheets to the 31st of March last, and the Directors' Report; to declare Dividends; to elect Directors and Auditor in place of those retiring by rotation; and for the transaction of the other Ordinary Business of the Company.

The REGISTER of TRANSFERS WILL BE CLOSED on and after the 15th day of May, 1902, until after the Meeting.

Dated the 24th day of April, 1902.

By order of the Board of Directors,
J. L. WILKINSON,
Secretary to the Company.

UXBRIDGE AND HILLINGDON GAS CONSUMERS' COMPANY.

GAS COAL.

THE Directors of the above Company invite TENDERS for the supply of about 5500 tons of GAS COAL, deliveries of which are to commence in May, 1902, and finish the last week in April, 1903.

Tenders to be made out for the above quantity of the best description of screened or unscreened GAS COAL, either in whole or part from, or divided between, the Durham, Yorkshire, or Derbyshire Pits, delivered by Barge free alongside the Company's Works on the Grand Junction Canal, or by rail to Uxbridge Station, Great Western Railway.

Tenders are to state the names of the Pits from which the above description of Coal will be supplied, deliveries to be according to the instructions, and to the entire satisfaction, of the Company's Engineer.

Tenders to be received on or before May 5, addressed to the Chairman, Gas Offices, Belmont Road, Uxbridge, Middlesex, and endorsed "Tender for Coal."

W. M. GARDINER,
Secretary.

Uxbridge, Middlesex,
April 26, 1902.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

PINNER GAS COMPANY, LIMITED.

800 £5 ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 6, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By Order of the Directors of the

SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF 2000 £10 NEW ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 6, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

WALKER AND WALLSEND UNION GAS COMPANY.

SALE BY TENDER OF £14,476 12s. 6d. GAS CONSOLIDATED STOCK, INCLUSIVE OF PREMIUMS.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER £14,476 12s. 6d. GAS CONSOLIDATED STOCK, inclusive of Premiums, to be issued under the Provisions of the Walker and Wallsend Union Gas Act 1884.

Particulars and Forms of Tender may be obtained on application to the undersigned; and Tenders must be sent in so as to be received at the Office of the Company not later than Ten a.m. on Tuesday, the 27th of May, 1902.

The Stock will be allotted to the highest bidders, but no tender will be accepted at a lower price than the reserved price.

By order,
CHAS. H. ARMSTRONG,
Secretary.

Offices: Mitchell Street,
Walker-on-Tyne, April 18, 1902.

Now Ready, Price 2s., Bound in Cloth.

THE
CALORIMETRY
OF
Producer and Illuminating Gases, with Special Reference to Future Legislation.
BY
JOHN F. SIMMANCE,
ASSOC M.INST.C.E., M.INST.MECH.E.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

JOHN HALL & CO.,
STOURBRIDGE,
Manufacturers of
FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS.
And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

CRESSWELLS' ASBESTOS CO., LTD.
WELLINGTON MILLS
BRADFORD, YORKS.

Asbestos Spinners and Manufacturers.

Telephone No. 950. Tels.: "ASBESTOS, BRADFORD."

If you have any trouble with your BELTS slipping on the Pulleys, or Drying and Cracking, drop us a post card or a **Free Trial Tin** of our
Asbesteucalypt Belting Syrup.
Ask for No. 6 Catalogue.
Asbestchoucine for Rubber, Gutta, and Balata Belts.
Applications for Colonial and Foreign Agencies desired.

HARDMAN & HOLDEN, LD.
ESTABLISHED 1820.
SULPHURIC ACID.
MADE from Spent Oxide (free from Arsenic) and of excellent Purity. Specially prepared for Sulphate of Ammonia Manufacturers.
Works: BLACKBURN; Miles Platting and Clayton, MANCHESTER.
Head Office: Miles Platting, MANCHESTER.
Inquiries Solicited.

NITRATE of Thorium and Cerium,
FABRIK CHEMISCHER PRAEPARATE VON STHAMER, NOACK, AND CO., HAMBURG.

DAMPFKESSEL-UND
GASOMETER-FABRIK
VORMALS A. WILKE & CO.)
BRUNSWICK, GERMANY.
MAKERS of GASHOLDERS & GAS PLANT.

HOT WATER INSTANTLY
NIGHT OR DAY.
Hot Bath for ¾d. in Minutes.
Boiling Water in a Single Minute.
EWART'S
LIGHTNING GEYSER
For Gas or Oil.
Always in action at
346, EUSTON ROAD.
Price List (Section 39) Post Free.
15
GOLD MEDALS & AWARDS.

E. R.
CORONATION
GAS ILLUMINATIONS
"BE IN TIME."
TUBES & FITTINGS.
THE
Staffordshire Tube Co., Ltd.,
BIRMINGHAM.
Telegraphic Address: "UNBEATEN."

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
Gas Engineers' Agents and Contractors for METERS, FIRE-CLAY GOODS, OXIDE OF IRON, AND ALL OTHER GAS APPARATUS.
Inquiries Solicited.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES
DALKEITH, N.B.

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MAY BE HAD OF THE PUBLISHER
PRICE 2s. EACH.

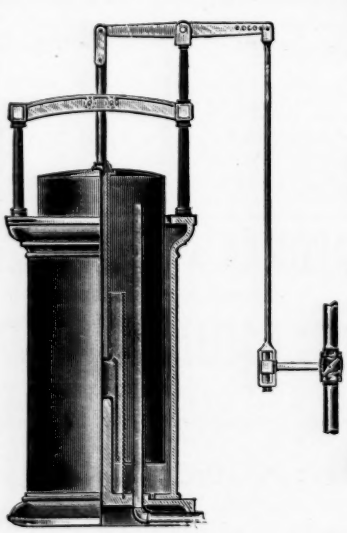
THE THAMES BANK IRON CO.
UPPER GROUND STREET, LONDON, S.E.,
SUPPLY FROM STOCK
CAST-IRON RETORTS
AND ALL KINDS OF GAS-WORKS APPARATUS
SOCKET-PIPES FOR GAS OR WATER PURPOSES.
FLANGE PIPES FOR STEAM.
Sole Manufacturers of LYON'S "PATENT" GAS-MAIN SYPHONS.
AGENTS FOR
ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

THOMAS BUGDEN, MANUFACTURER OF
TAR and LIQUOR HOSE, and Special AIR TUBING.

BELLOWS made to inflate a 48-inch Bag under One Minute. Various sizes made.

Stokers' Mitts, from 13/6 doz.
Made from best Tanned Leather.
India-rubber Hose, Sheet, and Washers of every description, Leather Bands, Oils, &c., Diving and Wading Dresses, Waterproof Coats, Capes, Sewer Boots, and Theatrical Dresses.
Fire-Engine Hose and Appliances.
Best Materials and Workmanship Guaranteed.

Miners' Woollen Jackets
No. 1, 12/- each; No. 2, 9/6.
Gas-Bags for Mains.
Gas-Engine Bags.
71, GOSWELL ROAD, E.C.


HYDRAULIC STEAM-REGULATOR
PATENT
for Controlling the supply of Steam to the Engine driving Exhauster according to the make of gas.
The peculiar construction makes it impossible for the Regulator to work other than gradually, as liquid has to pass in or out of a small hole as the Bell rises and falls.
JAMES MILNE & SON, LTD.
EDINBURGH.
LONDON. GLASGOW. LEEDS.